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Cooperative Training in Automotive Maintenance

Earl L. Bedell and Frank Carpenter***

TRADE training should be provided to fill very definite needs. The Detroit Automobile Dealers Association and the manufacturers of automobile tools and accessories have convinced the Detroit Board of Education that there is a very definite need for trained mechanics in the service garages. To meet this need, the Detroit Board of Education established a coöperative system of training with the Detroit Automobile Dealers Association which has been in operation for two years. Forty-six young men are now receiving this training and twelve have completed the prescribed course and are holding responsible positions in the service garages of Detroit.

This coöperative training program performs two definite services; first, it gives an educational development with the theory of the objective always in view, and, secondly, it acquaints the pupil with the modern conception of work, i.e., the practical side of the objective.

There is nothing original in the Detroit plan of coöperative training. In fact, a careful study was made of the plans used in other cities, and the teachers and directors of this work visited other communities to view the work at first hand. An analysis of the difficulties in which other communities have found themselves, as well as a study of their success have proved, it is hoped, equally valuable in laying a foundation for a successful system.

And the system appears to be successful. The plan involves three parties in a contract: First, the student who will receive the training. Second, the Detroit Board of Education who will administer the training the same as it administers any other educational function in Detroit. Third, the Detroit Auto Dealers Association who will use the student in profitable employment just as soon as the student's training will permit.

The student must have completed eight or more grades of regular schoolwork before entering the coöperative work, and he must be 16 years of age when entering any garage or service shop for apprenticeship training. Trade classes in auto mechanics are maintained in the intermediate schools. The course provides one year of preliminary training. It is an elementary course introducing the entire scope of automotive instruction. During this course the students' mechanical ability, general intelligence, and physical fitness are carefully observed by the principal and teachers. It is a probationary or tryout period. At the end of the year's course (in some cases boys of excep-

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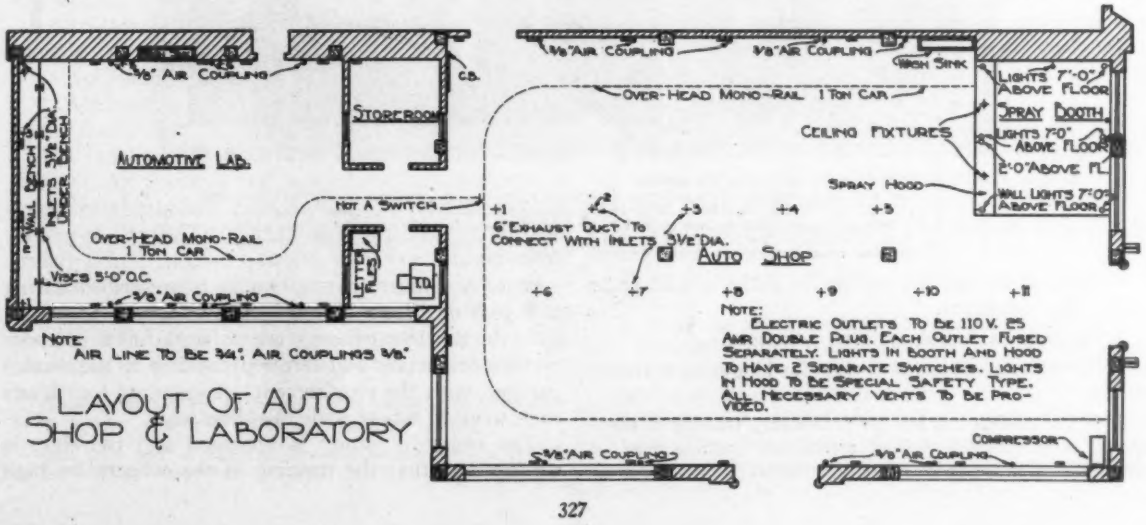
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HIGH SINK
OVER-HEAD MONO-RAIL 1 TON CAR
CEILING FIXTURES
SPRAY HOOD
LIGHTS 7'-0" ABOVE FLOOR
SPRAY BOOTH
LIGHTS 7'-0" ABOVE FLOOR
2'-0" ABOVE FL.
WALL LIGHTS 7'-0" ABOVE FLOOR
+1 +2 +3 +4 +5
6" EXHAUST DUCT TO CONNECT WITH INLETS 3¼" DIA.
AUTO SHOP
+6 +7 +8 +9 +10 +11
NOTE: ELECTRIC OUTLETS TO BE 110 V. 25 AMP. DOUBLE PLUG. EACH OUTLET FUSED SEPARATELY. LIGHTS IN BOOTH AND HOOD TO HAVE 2 SEPARATE SWITCHES. LIGHTS IN HOOD TO BE SPECIAL SAFETY TYPE. ALL NECESSARY VENTS TO BE PROVIDED.
⅜" AIR COUPLING
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COMPRESSOR

LAYOUT OF AUTO SHOP & LABORATORY

tional ability are taken at the end of five or six months) the successful students are transferred to the coöperative high school. Here the boy is introduced to an automotive shop that is equipped and organized quite similarly to an up-to-date service garage.

The length of time a student remains in this shop as a full-time student depends on a great many things.

1. The student must demonstrate his ability to work under actual shop conditions.

2. His technical knowledge must be adequate.

3. There must be a suitable place for him in some service garage.

4. If the student has had no preliminary training in automotive work, the full year of preliminary training must be accomplished in the coöperative high school.

Practical experience has shown that students who have had the preliminary course in the intermediate school can be released on the coöperative plan after four or five weeks of intensive training.

The second year is a period of part-time work in the service garages. The students work in pairs, one is in school two weeks while his partner is in the service garage. A definite scale of wages is prescribed during this year of "two weeks on and two weeks off."

In the third year these students work full time under regular conditions and terms prevailing in the service garages, with the requirements of spending four hours each week in school with full-time pay.

The course of study is arranged and the shop is equipped so that the training in the coöperative high

FIG. 1. The floor-man writes up the orders.
FIG. 2. The seal of the school. This seal was designed by the "co-op" students in interior decoration.
FIG. 3. The Wilbur Wright Building. It is the home of the automotive and other coöperative divisions.
FIG. 4. Grinding Valves—Modern and up-to-date methods are used in teaching good service garage practice.
FIG. 5. Shop Sketching—The boy learns to read blue prints, wiring diagrams, and how to make free-hand working drawings.

school will be up-to-date and practicable. The school takes cognizance of the fact that a good mechanic must understand and be able to use the precision instruments necessary for making mechanical, electrical, and chemical measurements. A good mechanic must have a sufficient knowledge of the fundamentals of the general sciences, physics, mechanics, dynamics, chemistry, and mathematics in their application to his work. Training is provided in the arts of welding, brazing, lead burning, soldering, heat treatment, and machine-tool operation.

The following is a synopsis of the course as arranged for the information of interested students, and as it gives the essentials of the subject matter covered it is being included in this description.

General Studies in the Course

Garage Practice: Thorough and actual repairwork on "live jobs" comprises one half of the time devoted to this course. Under capable instructors, all phases of automobile service are covered. Electrical units are covered both in the laboratory and in the shop.

English: Expression of one's thoughts is a relatively simple task when stimulated by keen interest in the subject. Discourses on radio, baseball, or music, by enthusiasts, are illustrative. To the boy interested in the automobile, explanations of the functions and operation of its units are a stimulus for the use of better English. With this as a beginning, the youth is taught to express himself upon other subjects upon which he has obtained the necessary information. Correct oral and written English are outstanding features of this training program.

Technology: The automobile incorporates practical applications of many of the laws and fundamentals of science. Engineers have drawn from every source, those features which make the automobile the efficient and comfortable machine that it is. The physics, chemistry, and mechanics of the vacuum tank, carburetor, differential, and electrical system are suggestive. The story of oil and fuels, of the metals and materials used in the construction and operation of this vehicle, lead us into the realms of geology, mineralogy, and metallurgy. The same force of gravity and laws of motion which control the automobile govern the movements of the universe. The possibilities in this subject are unlimited.

Management: A most appropriate time for initiation into the science of business is when the boy earns his first wages. It is harder to spend a dollar wisely than to earn one. For those simple, yet vital experiences on the job, the boy is led to investigate the more involved problems of business. Flat rate and bonus systems, labor and capital, business organizations, supply and demand, capital goods, stocks, bonds, and banking methods, transportation and industrial history, are among the many lessons taught.

Mathematics: Pure mathematics present many difficulties to the learner, but when a concrete problem arises that is closely connected with some job on the automobile, the computation becomes a tool for doing the job. The problems in arithmetic, algebra, geometry, and trigonometry to be found in the solution of problems based on gears, angles, levers, etc., are unlimited. All the fundamentals in the mathematical processes are therefore made part of the course.

Drawing: Enough drawing is taught to enable the apprentice to make sketches in an adequate manner, and to read the detail, section, and assembly drawings in service manuals and instruction books.

The service garages coöperating with the Board of Education in the training of young men for productive employment are giving Detroit a social service which might well be emulated by other groups in organized industry. Those who direct young men concerning their life vocation assume some serious responsibilities. One of the tragedies is to misdirect. It is one of the solemn duties of both the school authorities and the service-garage managers to see to it that enthusiasm for the system does not inveigle too many boys to enter this training, thereby flooding the market for this type of labor. Misplaced enthusiasm might lead to the erection and equipping of buildings far in excess of the actual needs for this particular field of instruction.

As yet, Detroit has little to fear in this direction, as the demand for boys trained as auto mechanics exceeds the supply many, many times.

Printing Tests for the Junior High School[1]

*Glen U. Cleeton**

THREE types of tests may be of service to the instructor in junior-high-school printing classes, namely,

1. Aptitude tests
2. Achievement tests
3. Standardized achievement tests.

The functions of these three types of tests are quite distinct. An aptitude test is intended as a measure of talent or ability in a given field. Achievement tests are prepared by the instructor or supervisor to measure progress in a specific teaching situation. Standardized tests are used primarily to measure status in terms of standards or norms determined from the use of these tests in other school printshops. In order that we may intelligently discuss the value of tests to the junior-high-school printing instructor, we must have in mind both the objectives of industrial-arts instruction in printing in terms of expected outcomes of teaching and the objectives ordinarily proposed for the junior high school.

Concensus of opinion among writers on the junior high school gives prominence to the following purposes of industrial-arts instruction of which printing is a rapidly growing branch:

1. To provide a foretaste of the field of work through exploratory experiences.
2. To provide opportunities for pupils of widely varying abilities.
3. To retain pupils in school through better adjustment of the curriculum to the needs and abilities of individual pupils.
4. To provide a background for both vocational or technical and liberal types of later training.
5. To provide training which will aid in the development of avocations, hobbies, and spare-time activities.
6. To provide consumers' or utilizers' knowledge and ap-

[1]This paper was presented at the ninth annual conference on printing education, held at Carnegie Institute of Technology, June 23–25, 1930.

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preciation of the products of industry along with skill in the use of, and ability in the making of minor repairs or adjustments on such products.

Without attempting to outline a junior-high-school course in printing which will harmonize with the objectives just indicated, the following elements are suggested as important units in such a course of study:

1. Twenty to one hundred operations related to printing technique depending upon the amount of time allotted to the work.
2. Studies in printing occupations.
3. Studies relating to the industrial uses of printing.
4. Studies relating to the general social and economic significance of printing.
5. The materials of printing.
6. Correlation of printing with English and mathematics and other basic school subjects.
7. Application of art principles to printing.
8. Historical studies in the development of printing.

Our question now becomes— In view of the objectives stated and course elements indicated, how may the three types of tests mentioned be of service to the printing instructor?

Since one of the major purposes of the junior high school is that of guidance through exploration and discovery of talents, printing aptitude tests may well be made a part of the classroom program in junior-high-school printing. The chief barrier to the use of such tests is that adequate ones do not exist. We know what a good printing aptitude test should do but we have never seen one. Aptitude tests of a mechanical nature, tests of artistic abilities in some fields, and tests of general scholastic aptitude are available, but the writer knows of no printing aptitude test strictly speaking. It is probable that such tests will be developed in time, but a considerable amount of research will be required. Since the junior-high-school course in printing will presumably be organized to promote guidance through exploration and discovery, tests of pupil progress may be taken as indicators of aptitude. Guidance based on measures of pupil progress will not ordinarily be seriously in error. Until such time as suitable aptitude tests are developed, progress may well be taken as a measure of aptitude.

The primary purpose of the classroom test is that of revealing to the instructor the effectiveness of his teaching. Such tests should measure the extent to which the objectives of instruction have been achieved in terms of skills, factual knowledge, understanding, and appreciation. Tests of this type should measure minutely the details included under each unit of a course outline. It is desirable that such tests be constructed by the instructor on the job or by the instructor in coöperation with his supervisor. Formulation of such tests presumes a carefully organized course of study and, likewise, presupposes a good working knowledge of objective test method. A total of 1,500 to 2,500 test questions will ordinarily be needed if the work is to be adequately measured. Selection and arrangement of test items to insure validity, reliability, and ease of administration and scoring should be given careful attention by the person who undertakes to construct objective classroom tests. Such books as the following contain excellent instructions for preparing objective examination questions of the short-answer type:

G. M. Ruch, *Improvement of the Written Examination*, Scott, Foresman and Co.

D. G. Paterson, *Preparation and Use of New-Type Examinations*, World Book Co.

Within recent years, several improvements in arrangement of test items to insure ease of scoring have been developed. The arrangement of test items used in the Carnegie Tests of General Mental Ability (distributed by C. H. Stoelting Co.) is a good example of form in arrangement for quick scoring. Better still is the self-scoring method developed by Professor Frank L. Clapp, of the University of Wisconsin. (Clapp Self-Scoring Forms are published by Houghton, Mifflin and Co.)

Summary of Conclusions

1. Wise use of tests presumes a careful analysis of needs and organization of teaching material to suit needs. Selection or construction of tests should be governed by the purposes or objectives of teaching.
2. Determination of aptitude in printing calls for research at present rather than the application of ready-made aptitude tests. Aptitude can be estimated from achievement tests.
3. Pupil progress may be measured most adequately by classroom achievement tests. Such tests should be constructed by the teacher on the job. They should be objective in nature and should completely displace the old, cumbersome, unreliable essay type of examination. The teacher who undertakes the construction of objective classroom tests should master the techniques of test making and should be on the alert to learn of new improvements in test construction.
4. Standardized tests in printing so far made available have emphasized the vocational rather than the industrial arts point of view. They are, therefore, of quite limited value to the teacher of junior-high-school printing.
5. Suitable standardized tests for junior-high-school printing cannot be developed until we have provided a generally accepted course of study in printing for the junior high school. The development of such a course of study should be a matter of considerable concern to leaders in the field of industrial arts.

JACOBEAN CUPBOARD
Courtesy of Metropolitan Museum, New York City

Aviation in Secondary Schools[1]

*Andrew Roswall**

Part III

IN former articles in the INDUSTRIAL-ARTS MAGAZINE, brief outlines of the course of study and the requirement of shop equipment have been discussed. In this article the writer wishes to discuss other important factors relating to the training of aviators in the schools.

In order to carry on this work successfully, well-trained leaders must be chosen. The saying that "the school is what the teachers make it," is particularly true of the vocational school where the duties and responsibilities are greater than in any other institution of learning.

The first requisite of the vocational teacher is, that he be an exceptionally good mechanic. In addition to this, he must have the qualification and personality required as a teacher. Because of these dual requirements, it is, and always will be, a problem how to obtain the man for the job, and this has proved to be particularly true in trying to find men who possessed all the qualifications required to teach the mechanics of aviation.

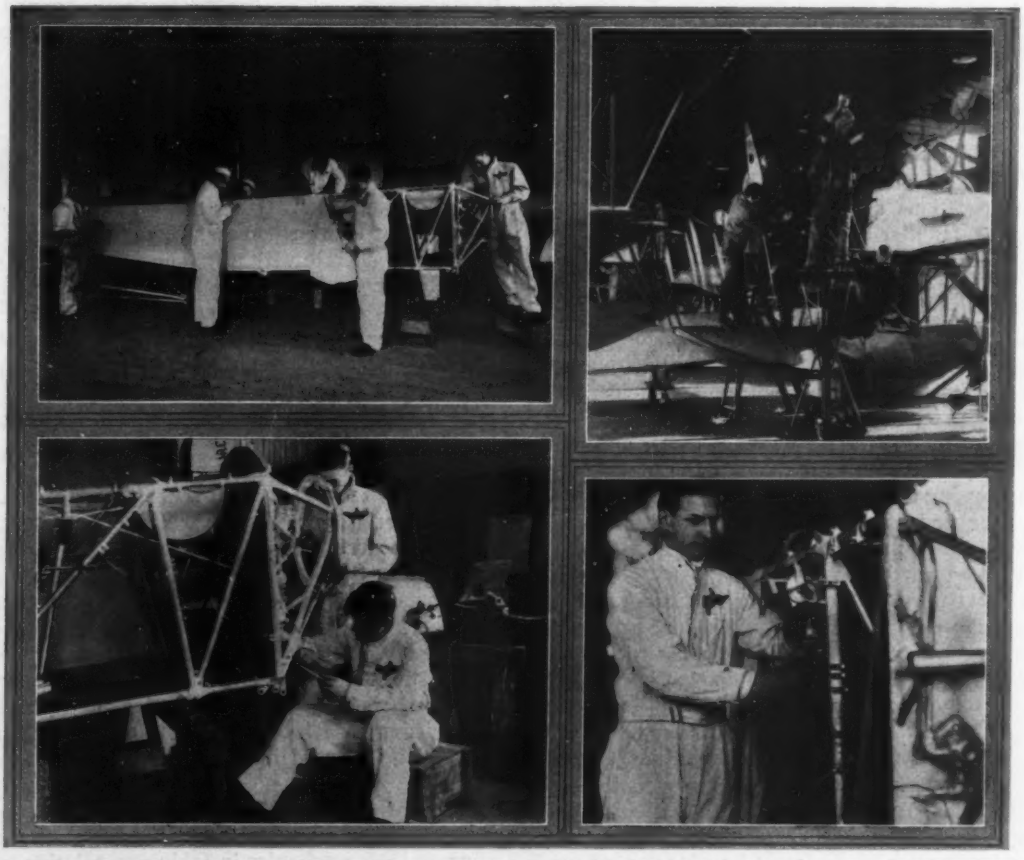
When, in addition to trade experience, educational requirements, mental fitness, and personal qualifications, it is necessary that the man who is to teach airplane mechanics, also must hold a Department of Commerce license as an airplane mechanic, it is evident that it becomes a real problem to secure teachers for the job.

The Department of Commerce is very strict in issuing these licenses and very few men have been able to secure one. A recent examination was held in Boston for teachers in aeromechanics for the Boston Trade School. The examination was advertised extensively, but only four applicants appeared, three of which the writer had secured by solicitation through Army and Navy acquaintanceship. This is the situation in a city that has one of the largest, if not the largest commercial airport of the country in the east.

There is, however, a possibility to induce young men who have completed their time of service with the government in either the Army or Navy as airplane mechanics to take up teacher training with the intention of becoming teachers of this subject. These men have been trained in aeromechanics by the Navy at

[1]Parts I and II appeared in the December, 1929, and April, 1930, issues of this magazine.

*Boston Trade School, Boston, Massachusetts.



STUDENTS AT THE BOSTON TRADE SCHOOL AT WORK ON NAVY PLANES FOR THE U. S. NAVY DEPARTMENT

Great Lakes Naval Air Station, or Pensacola, Florida; or by the War Department at Kelley Field, Texas; or at Bollings Field, Washington, D. C.

Men with this training are excellent material for teachers. There is, however, an important drawback in securing them, and that is the salary which schools can offer for this kind of work.

In this field, as well as in any other, it is always a question of supply and demand, and at the present time the demand for skilled airplane mechanics is greater than the supply. Commercial transport companies are signing up with long-time contracts all first-class men as soon as they leave the government service at a larger salary than most schools are able to pay.

It is almost a hopeless task to induce these men to prepare themselves to become teachers, when without sacrifice of time and money on their part, they can command a larger salary with a chance of rapid promotion with a private concern.

To obtain the right men, therefore, it is necessary that school authorities offer a salary and opportunities of advancement comparable to those offered by private concerns.

What Should be Included

In establishing this course in any vocational school, it is well to differentiate between practice work and commercial work.

All practice work consists of taking apart and reassembling motors, instruments, and complete planes. This practice work may be carried out on materials furnished by the government. It may be laid out on the basis of progressive steps, and should include such work as replacing broken ribs, spars, tail and nose webs, making and replacing longerons and struts, splicing and coppering of joints, sewing, doping and painting of fabrics, bracing and lining up a ship, applying safety wires and cotter pins, and such other manipulative operations as are required to train students to become familiar with the work of the airplane mechanic.

For the engine mechanics' practice, the work may be developed along the lines of taking apart "V" and "radial" type motors and assembling them again, removing, taking apart, and assembling carburetors, magnetos, starters and instruments, replacing parts, soldering and repairing gas and oil tanks, and so forth. In this way the work, as applied to motor and power plant, can be divided into units, and each unit into jobs, advancing from the simple to the complex.

After the student has become familiar with the different kinds of work required on a plane, he is ready to apply this knowledge on commercial work.

The department of vocational education in the State of Massachusetts requires that work done by students shall have commercial value. This applies to all trades taught in vocational schools reimbursed by the state, and therefore, also affects the work done by the students in the course of airplane mechanics.

For this reason it is necessary that the school do work on commercial and private planes. All planes, aside from the Army and Navy planes, come under the supervision of the Department of Commerce, and all repairs on such planes must be executed or supervised by mechanics holding Department of Commerce licenses.

For this reason it is necessary that the instructor who supervises the work done by students be required to hold such a license, so that the school may be permitted to repair and recondition planes for further service.

With the present number of planes in constant use — and the number is increasing daily — there is at present a shortage of repair shops to take care of the needed repairing and overhauling.

When it is considered that the average plane, including the motor, needs a complete overhauling after every 300 hours' flight, it is evident that men and shops are needed for doing this kind of work.

There is no doubt that there are airports, flying clubs, or private individuals who would be glad to avail themselves of the opportunity of having planes overhauled by the school at a nominal cost, thus giving the students an opportunity to do real commercial work.

What are the opportunities of employment after graduating, may be asked. The Department of Commerce reports that the industry lacks the properly trained men that it requires, and personal observation substantiates this fact.

Salaries of first-class mechanics average from fifty dollars a week and up. Foremen receive from sixty dollars and up according to ability, and it is quite safe to predict that the supply will not exceed the demand for a long time to come.

Promotions in this industry are very rapid for the technically as well as the mechanically trained man, but, of course, it depends entirely on the individual what degree of success he may attain.

Obtaining Instructional Material

Perhaps no industry has been so generously dealt with by the government as aviation. The Army and Navy departments, Department of Commerce, the Government Printing Office, all located in Washington, cordially coöperate with any school that may apply to them for books and materials. In most cases this coöperation is given without cost to the school. Private concerns engaged in the aviation industry are no less generous. Plans, blue prints, and printed pamphlets are freely sent out to schools with the assurance that information about new developments in the future will be forwarded immediately.

Because of this willingness to coöperate, it may not be out of place to forewarn schools not to requisition more material from the government than is actually needed, because, although the government at the present time has a lot of accumulated airplane material and parts, it may be possible that if a sudden rush of requests for large orders were granted, a number of well-deserving institutions could not be accommodated. Then, too, the models and styles of construction change so rapidly that no school cares to find itself burdened with a lot of obsolete and useless material for which it would be held responsible by the government.

We all realize that the ambition of the average student taking up aviation is to fly. Several airports encourage their mechanics in taking up piloting, and, as

a rule, the mechanics get all the flying they want in trying out the planes that have been repaired. Many pilots make it a practice to take up their mechanics as a check-up on the work, for if anything goes wrong "it is just too bad" for both mechanic and pilot. At an airport near Boston several young mechanics are being instructed in piloting as part of their pay, and without a doubt other airports offer the same opportunity.

Aviation is still in its infancy. No doubt 25 years from now our planes will be as radically different from the plane of today, as the present planes are from those 25 years ago, and the world is awaiting the genius who will revolutionize the airplane industry, as the auto industry was revolutionized by Ford. The airplane Diesel engine, turbine, and compressed-air engine has yet to be invented or perfected, the motor operated by radio has been dreamed of, the gliders without any motors, the heliocopter or any other similar plane that can rise vertically are only a few possibilities of the future, and who knows but some young man or men educated in aviation in our public secondary schools will solve some of these problems.

Developing and Maintaining Interest as a Motive Factor in Industrial Education

*J. I. Sowers**

ONE of the studies made in our local manual arts and drafting teacher improvement course during the past year, was a study of interest as a factor in the motivation of learning in our particular field of education. We continued this study over a period of several months; long enough to make what appeared to us to be a worth-while contribution to our work. We found that while it is commonly agreed to be axiomatic, that *interest* is a major determining factor in any successful accomplishment; yet comparatively little has been written on the subject of motivation through interest in the field of industrial and vocational education.

Our problem, then, seemed to be that of developing some usable factors for developing and maintaining interest as a motivation of our work. The problem of the teacher is to get the student to take an interest in the things that society, through the school, is offering.

When boys first take up shopwork it is true that they do so with an exhibition of more interest and a greater show of enthusiasm than is manifested in any other form of school activity. Yet as they go further along in the course we often find that this initial interest begins to wane, and that the shop loses its appeal. To determine what is responsible for this change of attitude, it is necessary to study the interest factors that may be used in bridging the gap between temporary and permanent interests.

The teacher who is earnest in his desire to guide and to develop the interests of his students soon discovers that he must reach within and touch the mainsprings of human thought and purpose. It is well for the teacher to be acquainted with, and to have a list of some of the natural impulses that lead to interest. The following is such a list and contains some of the natural impulses most useful:

Activity	Imitation
Curiosity	Love of approbation
Wonder	Altruism
Creativeness	Ownership
Community of purpose	Competition
Self-advancement	Love of prominence

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If we attempt to discover the motivating purpose behind the things that individuals do, we shall find that they have their origin in one or more of the natural impulses. These impulses, then, seem to supply an explanation of the interest we manifest in our acts. It is not too much to say that in the natural impulses we have the origin of interest. What we strive for, and what we accomplish and become through our striving, depends upon the degree to which these natural impulses are awakened.

In laying our plans for our work — in the making of courses, in lesson planning, in demonstrations, and in all our work as teachers — it is essential then, if we wish to arouse interest, that we bring to our aid the driving power of the natural impulses.

A skillful teacher usually has little difficulty in arousing impulses which result in interest. At the opening of the lesson hour if the teacher himself displays by his earnestness, quality of voice, and demeanor a deep personal interest in the work of the hour, he will be pleased to discover that presently his interest has been communicated to certain members of his class, and from these, others catch the spirit until it runs throughout the entire class.

Results Obtained

The following are some results of our study of methods successfully used in arousing interest through the natural impulses:

1. The teacher must know what he is seeking to teach. His course must not be a rambling making of things, but it must be a definite acquiring of predetermined skills, desirable habits, and useful information. Students will soon lose interest in a course that has no definite objectives. Boys are not always found hungering and thirsting after knowledge, but they are keenly interested in the acquisition of new abilities, powers, and skills.

2. Difficulty of accomplishment, and a demand for a high degree of skill and accuracy may kill interest in a young pupil, while with an older student — one able to understand remote and deferred values — these same factors are an important means of creating and of sustaining interest.

3. Order and system are contributing factors in maintaining interest that no teacher can afford to neglect.

4. Well-thought-out lesson plans, and good demonstrations, and instruction sheets are important interest factors. The teacher must seek to form a bond bridging over the gap from that which has been learned to the new thought or accomplishment about to be acquired.

5. Contests are one of the oldest factors used in creating interest and they are just as useful and effective in the shop or the drafting room as on the athletic field. The teacher who does not introduce the spirit of competition into his work is failing to use one of the most easily aroused of the natural impulses. The use and nature of contests possible in our work, opens up a whole new subject which might well form the basis for considerable discussion.

6. Careful marking and grading of work is a great factor of interest, and one too often neglected or poorly done. Every boy likes to get good marks. Grading and displaying of class standings, then, forms one kind of competition which is easy and proper to use, and which operates all the time in the shop.

7. The teacher should use remote incentives as well as immediate ones. The creative joy in making a project, and owning and using it after it is made, are immediate incentives. The acquiring of the skills and knowledge which are a part of a trade and which will form a permanent equipment of the individual, are the remote objectives. Yet their acquirement should be recognized and kept in mind as the real and important goal.

It is true that all young people do not desire abilities with equal fervor. Yet once they are persuaded that a given ability or skill will prove valuable to them later, they will usually become interested in its acquisition. Skill itself is merely the result of a high degree of proficiency in the attainment of an ideal.

8. Interest is undoubtedly created by the wise placing of responsibility. To this end, students should be allowed to create their own design so far as may be desirable. They should be permitted to act as foremen, assistants, and helpers under the guidance of the instructor. The teacher who wisely undertakes to develop a sense of responsibility in his students is doing something which will be of great value to them in their future lives.

9. Maintain interest in the work by newness of experience. This means new models, new materials, a chance on the part of the students to design and create, and to try out new things. The urge for exploration and discovery is very old, and very strong, and its existance is an interesting part of the human make-up.

10. Keep ahead of your student with new tasks, different enough to be a real challenge to his ability. In order to take a keen interest in accomplishment, it is necessary that tasks and obstacles be faced that are real tests of skill. If you have a dull and uninterested student try putting him up against an undertaking that is difficult enough and important enough to be a real challenge to his ability.

11. Maintain interest through self-measurement. Have the student measure up his own work and grade it himself according to some predetermined standard for accuracy. Then have him keep a record in his notebook, of all work done so that he may work out a curve of the results of his work in the form of a graph.

12. Use the collecting instinct as an aid to interest. Boys are natural collectors of things, such as stamps, butterflies, shells, and what not. They will also become greatly interested in collecting samples of different woods, and in making other interesting and graded collections of the materials of industry.

13. Increase interest by means of variety. Anything, even a good thing, can be overworked. Keep your course as new as possible so as to give your students not only new things, but as wide a variety of experience as possible. *Variety is the spice of life.*

The factor of interest may be compared to the use of electricity in a factory — here turning machinery, there giving light, in another place heating a furnace. Interest is the driving power behind human endeavor. Since interest is so necessary to every kind of accomplishment, any suggestion that will assist in stimulating it, even in a small degree, is useful. Muscular experiences are more interesting than those that are wholely mental. In the racial experience of man, reading about things is a comparatively new and certainly an artificial form of gaining knowledge. Our keenest enjoyment is in manipulation, in making things, in handling things, and in getting tangible results from our endeavors. This, then, should place the industrial teacher in a particularly fortunate position relative to the maintaining of interest. Students are usually proud of their ability to make things for themselves. Interest, too, is very "catching." A few students with a high degree of interest can often stimulate a whole class. If a course is so taught that its social and economic objectives are broader and more outstanding than the mere making of things, or the acquiring of manipulative skill, permanent interest is likely to result. Our teaching will be futile, however, and our students uninterested, if we are not able to so stimulate them mentally as to cause them to accept the ideals which we are trying to have them attain.

CARVED CHAIRS, AMERICAN COLONIAL
1600-1650
Courtesy of Metropolitan Museum, New York City

Shop Management and Discipline

*Raymond N. Donelson**

IN observing school shops, one readily recognizes that there are varying degrees and types of discipline. First, there is the all-too-common lack of discipline found in so many shops. This type is readily discernible because of the noise that issues from such a shop. A closer inspection reveals that a small riot is in progress. Pupils are running about the room, only a few boys are seriously at work, the instructor is frantically engaged almost continuously in efforts to keep the shop from being wrecked. This state of affairs is most common when a new and inexperienced teacher is in charge, although it is sometimes met with in shops presided over by experienced teachers. From this extreme there are varying degrees until we reach the other limit where we find a shop which is more nearly like an academic classroom; where the pupils talk in whispers; where there is little, if any, communication between pupils; where the instructor stands in an attitude which clearly expresses the sentiment "discipline or die."

The proper standard of discipline is, of course, a happy medium between these two extremes. A shop where there is no unnecessary noise, where every boy is legitimately occupied, where there is enough freedom to allow the proper coöperation between pupils, where the relations between instructor and pupil are friendly and respectful; in short, a shop where it is not only possible but pleasant to work.

Factors That Make for Discipline

The casual observer of a properly supervised shop will usually fail to note all of the factors which enter into the perfection of its functioning. He will notice the harmony and the smoothness with which things are accomplished, but he will not notice the devices employed to produce this ideal state. This difficulty to perceive the activating principles is evident whenever anything in its final state of perfection is viewed. The practiced diver springs gracefully from the board, executes a difficult dive, and enters the water with hardly a ripple. The experienced pianist moves his fingers quickly and easily over the keyboard of the piano, unhesitatingly striking the keys and yet never sounding a false note. Both performances look easy; both performers seem to be exerting no special effort to accomplish their results. What is not evident is the long and laborious practice to which the diver subjected himself. His many falls and slips are not seen. Nor are the monotonous and tedious hours spent by the pianist on finger exercises evident. Yet each has gone through his practice period and slowly acquired the many factors necessary to produce the finished performance. The same thing is equally true of the teacher who is successfully managing his shop. His success is due to a combination of many factors.

The first of these is the teacher himself. His attitude toward his pupils influences their attitude toward him and it takes the average pupil only about two periods to determine, quite accurately, what the teacher's attitude is. If the teacher is surly and cross, the pupil's attitude also will reflect surliness and crossness. If the teacher is cheerful and patient, he will find cheerfulness and willingness to work in his pupils. If the teacher shows interest in his work and in the progress of his pupils, he will find that they also will be interested in the work and in their own progress. If his standards are high, the pupils will also form high standards. If his method of marking is slipshod, he will find the lazy taking advantage of the fact. If he shouts from one end of the shop to the other, the class will first imitate and later outdo him. If he is unfair, or unnecessarily abusive, he will find his pupils lying and cheating to escape this unfairness and abuse.

Of course, this reflection of attitude is not an instantaneous process. It only comes about after an appreciable length of time determined, to a large extent, by the positive strength of the attitude, but this reflection or imitation always occurs unless limited or influenced by other factors, and persistance on the part of the teacher in maintaining the right attitude will ultimately prove to be one of the strongest elements in successful shop management and discipline.

Another factor which helps to determine the success or failure of the management of the shop is the physical properties of the room. The size and equipment are usually fixed, so far as any effort on the part of the teacher is concerned, but the arrangement of the equipment and the system of handling tools and material is under the teacher's control. If things needed by the pupil are not ready and conveniently obtainable, the interruption to the work caused by the necessity of moving around to different parts of the shop in procuring the things needed, tends to create disorder, interference with other boys, arguments, and chances for accidents. To correct these conditions will naturally take some of the instructor's time, which ought to be spent on more important things.

In the ideal shop, the system of handling tools and materials and the arrangement of benches and machines must be such as to create a minimum of confusion. This, of course, means that the problem will have to be studied by each instructor for his own shop. It will not be solved in a day, or a week, or even a year, but will require constant changes and modifications.

Keeping the Student Occupied

If any one phase of management is to be selected as more important than the others, it would be the teaching method used. A shop where the pupils have only a vague idea of what they are expected to do, where there are always a number of boys idly waiting for the instructor to help them with their work, where there is a lot of work spoiled because the pupils proceed without really knowing how to do the job, where there are a number of boys disinterested in the work

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because they do not know enough about it, will always be disorderly and poorly managed in spite of any number of favoring factors to the contrary. There are two main reasons for this. The first is the pupil himself. If he is busy and interested he will not be disorderly, but if he is not kept usefully employed he will occupy himself with annoying the other boys and the teacher.

The second reason why a poor teaching method tends to create the wrong shop atmosphere is the amount of the instructor's time which is required to reteach individuals while the class is working. The wastefulness of a method which requires that a lesson be first taught to a class, and then retaught to a large percentage of the pupils in the class is obvious.

Individual instruction is necessary and desirable, but when a shop is observed in which the teacher never has a free moment while the class is in session, where, if the teacher is called away for a short period of time, a large number of boys stop work to wait until they can get his help, it is quite safe to say that the mismanagement is due to a poor teaching method. The building up of a proper teaching method or the correction of an improper one is as important as any other phase of the teacher's work.

The class lesson is extremely important. Many chapters have been written on the proper presentation of material and the various types of lessons with their advantages and disadvantages, and it is the responsibility of the shop teacher to equip himself with the modern theories on the subject and then to analyze his experience and profit by it until he has perfected his teaching technique. In addition to a properly presented lesson, job sheets in the opinion of those who have used them are almost indispensable. The importance of job sheets can be realized when it is remembered that the pupils in a class, due to their varying abilities, progress at different rates of speed so that while some boys are utilizing information presented in recent lessons, others are working on a part of the job which was explained perhaps weeks previously. These slower boys invariably forget, or at best only imperfectly remember, the information they need to properly do the job. Carefully prepared job sheets are a big help in cases of this kind, because they serve as a constant reminder of the information presented in former lessons. They also enable the fast pupil to progress beyond the rest of the class with a minimum of individual instruction. The time such aids save the instructor can be utilized to give the necessary individual help to backward pupils who really need it, or properly to supervise the activity of the class so that attention can be given promptly to incidents which, if neglected, would tend to create disorder.

To sum up then, good discipline and successful management of a shop depends upon several factors, the main ones of which are: a proper attitude on the part of the teacher, careful and systematic arrangement and handling of equipment and material, and an efficient teaching method.

Making Perspective Drawings With a Foreshortening Scale

*Frank W. Walsh**

Article IV

IN November, 1928, an unselected group of fourteen students, consisting of six students from the sixth grade, and two each from the seventh, eighth, ninth, and tenth grades from the schools at Oshkosh, Wisconsin, were given approximately twenty minutes' instruction in the use of a scale, and all, with one exception, were able to make good perspective drawings. They were also very greatly interested in the work. Figure 1 shows some of the work of students with a scale and illustrates the variety of its possibilities. This brief statement and the illustration may prove an encouragement to many to try out the scheme as a short cut.

A scale gives all measurements foreshortened to the proper distances for heights, widths, and lengths. From the previous article, it will be remembered that proportional measurements were taken of objects and distances in space, then transferred to the drawing paper. In order to make a scale for these proportional measurements, a fixed distance and position must be taken. The drawing that is reproduced by this scale will then be for this fixed distance and position.

Such a scale may be easily made. By taking measurements for a certain distance and position of some object and placing the distances on a piece of durable paper and then use these measurements for a scale.

To determine a natural position and distance at which you accurately observe objects, hold your pencil before you vertically, and allow what appears to be an inch of the pencil to extend above your thumb nail. Keep your hand in this natural position that you have selected for correct judgment of the length of one inch. Notice that your pencil is approximately 14 in. away from your eye. You have now established a correct distance from your eye to correctly judge small objects or inch measurements.

Next, hold a 1-inch cube in front of you. You wish to see how it shows to the best advantage and you naturally turn the corner toward you. You have now obtained a good position to correctly see an object.

Observe that the two receding faces do not appear to be an inch wide. This is due to foreshortening. If the cube is placed in front of you with the corner pointing directly toward you, then both receding faces will appear to be of the same width. The picture plane or sheet of paper on which you would draw the object

*State Teachers' College, Oshkosh, Wisconsin. (Articles I, II, and III appeared in the June, July, 1929, and January, 1930, issues of the INDUSTRIAL-ARTS MAGAZINE.)

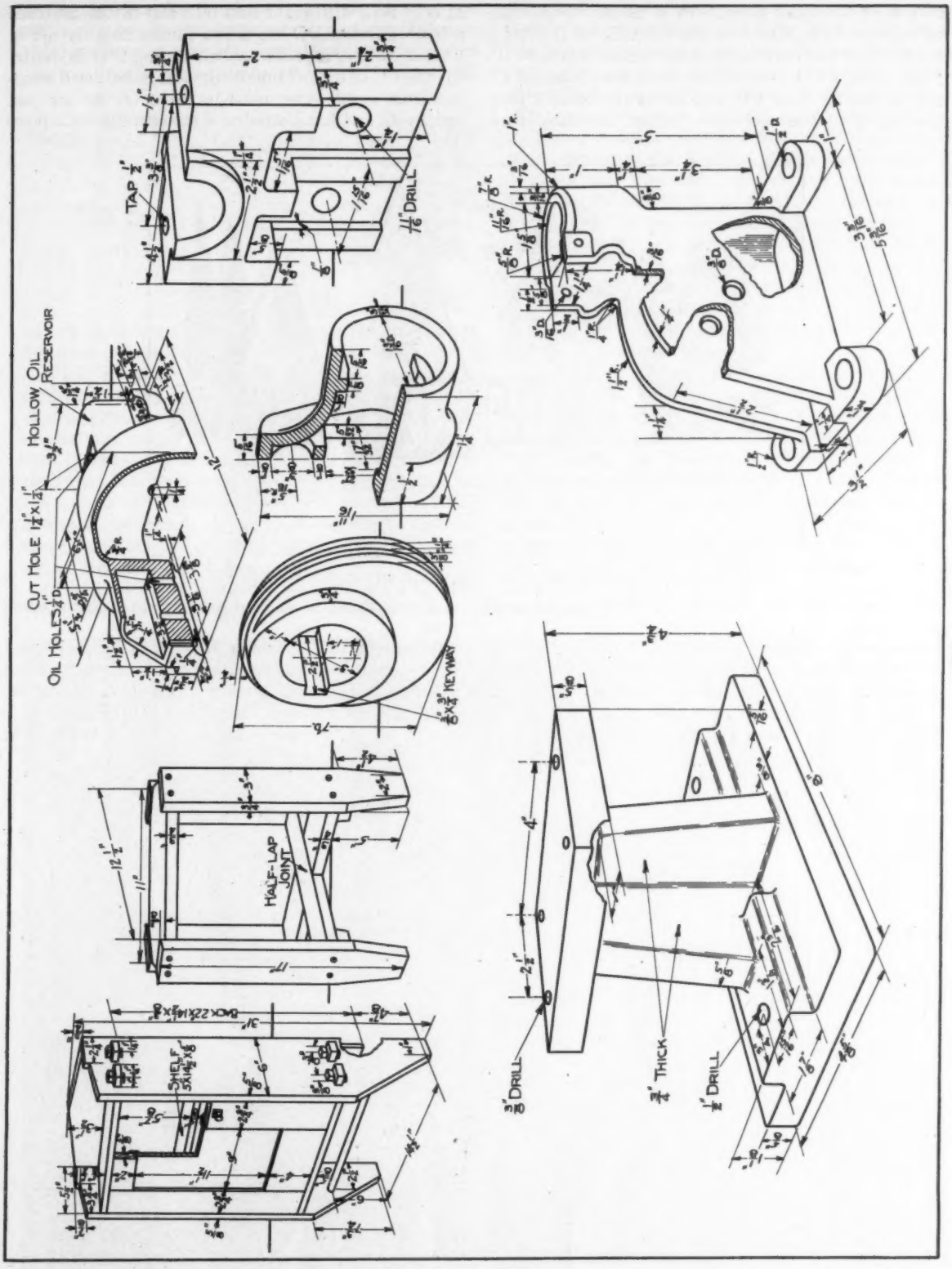
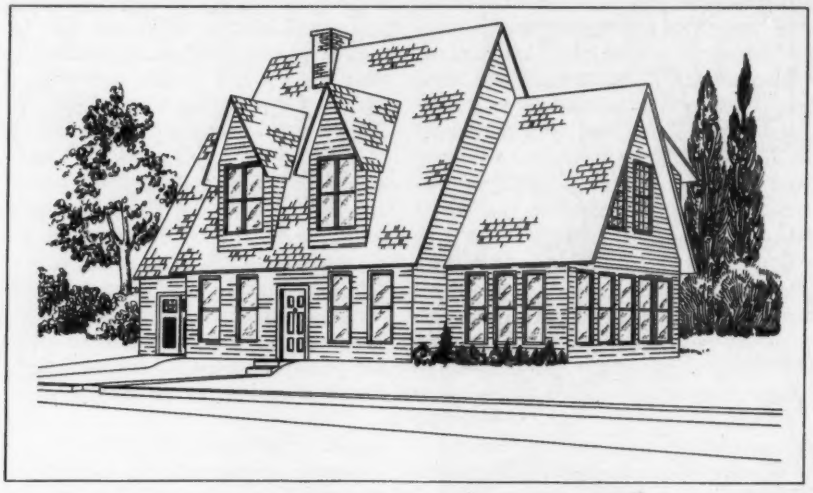


FIG. 1

would pass through this front corner of the cube and the vanishing points will be 14 in. to the left and 14 in. to the right on the eye level. If you would sight to the far corners of the cube, the points where you see the corners through the picture plane would be the proper foreshortened widths for the faces. Refer to Figure 2 which shows how 7 cubes, the edge of a picture plane or paper, and an observer would appear in relation to each other if they were viewed from above. The first or front cube, when placed as shown, would

only show the width from A′ to B′ as the foreshortened distance from A to B of the cube. From B draw a straight line to O intersecting the picture plane at B′. From C draw CO intersecting the picture plane at C′. B′C′ is shorter than A′B′ and shows the relative foreshortening of the successive inches. As many foreshortened inches and fractions of inches can be made as necessary.



ARCHITECTURAL DRAWING MADE BY MEANS OF THE FORESHORTENING SCALE

To obtain a height scale to go with this width scale, the same scheme of obtaining measurements can be followed. Figure 3 shows the best method.

The full measurements are placed on a vertical line which may be considered as the front corner of a stack of inch cubes, and a position 14 in. from this line is taken for the observer. OA is on the eye level and B is 1 in. below A. Draw an arc from A with center at O. From B draw a straight line to O intersecting the arc at B′. Chord A′B′ is the first inch and is foreshortened a little. CO and DO are drawn intersecting the arc at C′ and D′. B′C′ is shorter than A′B′, and C′D′ is shorter than B′C′. In order to make these foreshortened measurements usable, they must be taken off the arc consecutively and transferred to a straight line on a piece of strong paper to be used as a height foreshortening scale.

Figures 4 and 5 show a scale in use. In Figure 4 height measurements are being taken, while width measurements are being taken in Figure 5. Zero of the height foreshortening scale, shown in Figure 4, is placed on the eye level at the center of vision. The vanishing points are 14 in. to the right and left of the center of vision. Any height measurements can be taken off the scale at any desired distance below the eye level. If a vertical line is drawn down from the

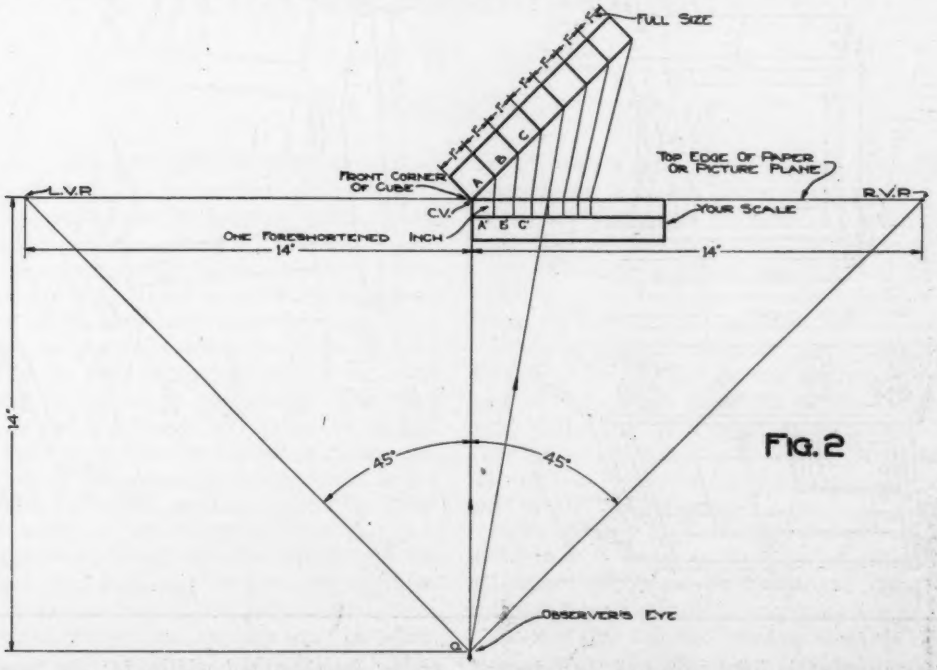


FIG. 2

center of vision, this line may be used as the front corner of the object and measurements can be placed on this line directly from the scale. From these points on the front corner, lines are drawn to the right and left

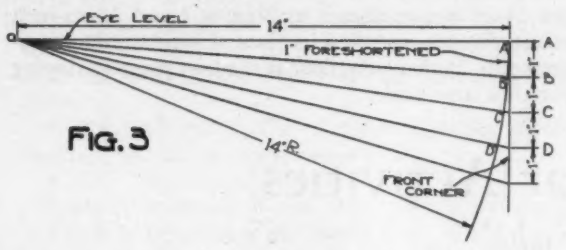


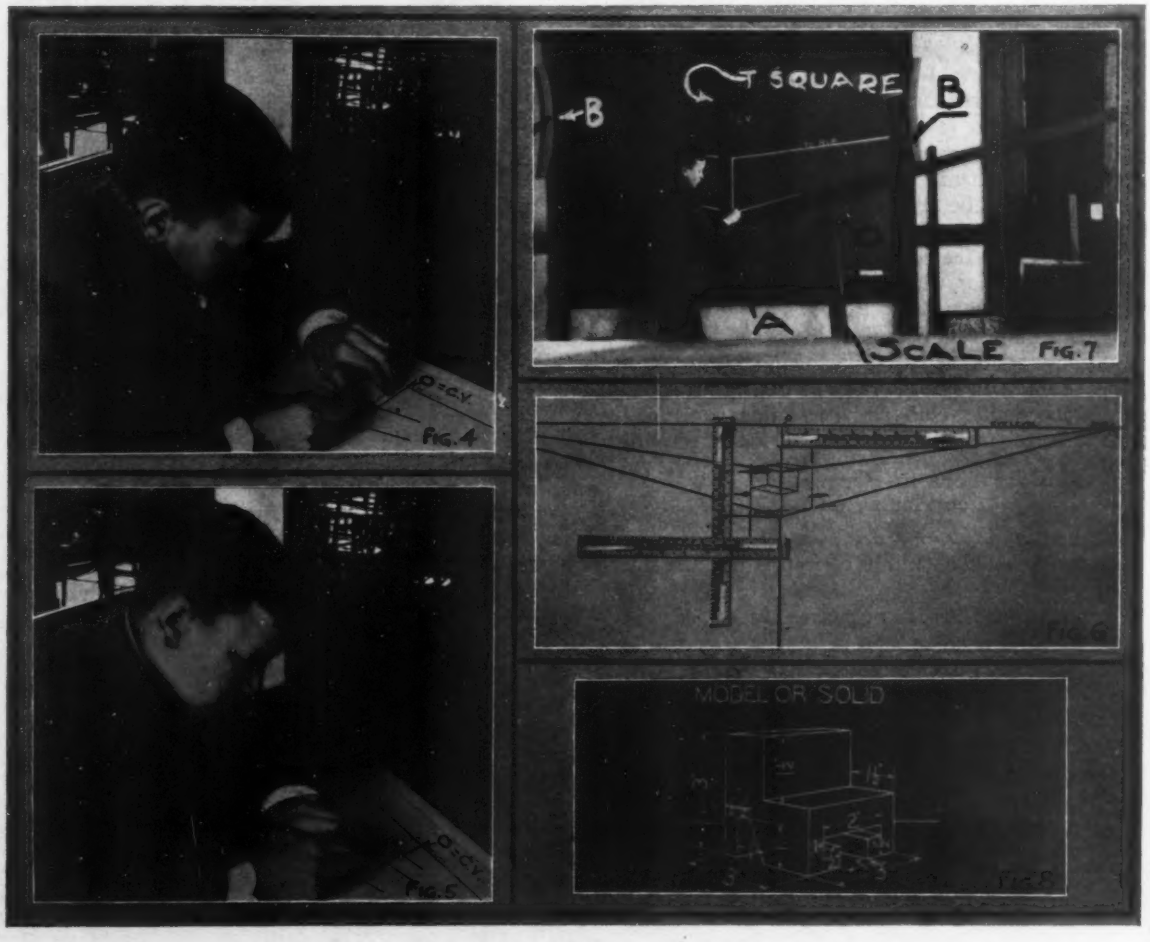
FIG. 3

vanishing points similar to the way they are being drawn in Figure 7.

When width measurements are taken, the scale is held horizontally across the paper, and zero of the 45-degree width foreshortening scale is placed accurately on the front corner of the object. In Figure 5 the student is measuring to the left from the front corner of the object that he is drawing on the paper. Notice that the scale is held horizontally. When these width measurements are found, vertical lines are drawn through these points to indicate the lines that are the farthest out on the solid that is being drawn.

If the reader now has a scale, let us draw a 2-in. cube. Then remove the top front quarter of it. Figure 6 shows one drawn with the scale in three positions for taking the three measurements of height, width, and depth. The height scale is regularly placed along the vertical line drawn down from the center of vision, but is shown farther to the left in the figure because it would hide part of the cube. You will notice that light lines are drawn from the measurements on the scale to the proper places in the drawing. Arrow points show the direction that they have been carried. Any measurements for height, width, or length can be taken with a scale and thus any three-dimensioned object can be drawn from it. One should remember that all lines that are parallel in any solid are to be drawn to the same vanishing point. The simplicity of this method of making perspective drawings and the wide variety of its applications should be of interest to teachers as well as to draftsmen.

Blackboard drawings are easily made in the same way, only the scale is six times as large. Figure 7 shows a student drawing lines to the vanishing points after he has measured the height of his solid on the front corner. The large scale is leaning against the blackboard and O is the zero on this scale. This zero was placed at CV when the height measurements were taken. This scheme is excellent for blackboard work where a teacher makes up problems or illustrations for his students. Figure 8 shows a completed problem drawn on the blackboard. It was drawn from given dimensions.



In Figure 7 a long straightedge is used for drawing the lines to the vanishing points. A heavy cord may be used for the purpose, and when held tightly the chalk can be drawn along it. Another scheme that has been used for the past four years is a T square with a curve cut in the head. This T square is shown in Figure 7. The curve fits on the curved pieces that are screwed to the edges of the board at B, and the edge which comes to the center of the curve gives the proper line to run to the vanishing points. The curve can be drawn with either vanishing point as a center. The vanishing points are taken at 7 ft. to the right and left of CV. The blackboard scale can be made similarly to the small scale. Only 7-ft. distances are taken in place of the 14-in. measurements in Figures 2 and 3. Six-inch measurements are taken in place of regular 1-in. measurements. Perhaps the floor is the best place for laying out this large scale.

Extracurricular Activities

*T. P. Fiske**

THERE are some fifty to sixty activities which may be sponsored with more or less success by teachers of junior or senior high school.

Almost any activity may be made into a club activity. The reason for so many failures in this type of work is because of lack of organization and the setting forth of definite aims for the work by the teacher.

An extracurricular activity should not be a burden but a real joy to the teacher who is conducting it because it should be conducted by the students and they should be given the responsibility for its success. The teacher should merely act as a guide and as a supervisor.

The meetings should be held during school hours, but enough interest should be aroused during this time to make it necessary for the teacher to spend several additional after-school hours with the club.

Since extracurricular activities are supposed to foster the interests of the students, no student should be made to take a choice which is distasteful to him. For instance, students who are not interested in athletics, should not be allowed to join the athletic club simply because they can satisfy requirements that way.

In each school there should be one teacher who is thoroughly familiar with this type of extracurricular work. It should be his duty to act as an adviser to the other teachers in conducting their work.

Since interest is such a big factor in securing results in education, and since interest is so easily aroused by the extracurricular club activities, this work really ought to be the most successful of all school activities.

Considerations in Forming an Extracurricular Club

I. *Name of the Club*

The name chosen should be appropriate to the activity sponsored.

II. *The Teacher Who is to Sponsor the Activity*

One should be chosen who is in sympathy with extracurricular activities and is familiar with the objectives of the club. The work will be more interesting to the teacher if it is different from the work that he usually teaches. Many teachers who have clubs which are the same as the subject which they teach, simply take the club activity to mean an extra hour of teaching.

III. *Organization of the Club*

Members should be chosen by the teacher with the idea of getting pupils who have a common interest. Rules setting forth qualities required for membership should be posted at the time that the pupils make their choice of clubs.

IV. *Officers*

Necessary officers should be elected by the club members.

V. *Outline of the Aims and Objectives of the Club*

An outline of the aims and objectives of the club with definite plans should be drafted after the problem has been discussed with the students who are members.

VI. *First Meeting*

The first meeting should take up the discussion of the aims and objectives of the club. A tentative outline may be presented at this meeting by the teacher and suggestions for improvement or material to be included received from the pupils.

VII. *Fees*

Since the extracurricular clubs as a rule are conducted outside of the regular school activities, it is necessary to collect a certain amount from each member for buying supplies, unless the board of education sees fit to furnish the money. These fees should be established by the teacher in advance and posted at the time the students are making their choice of clubs.

VIII. *Number Enrolled*

This number should be figured on a basis of how many the club can accommodate. Forty students is probably the largest number of members any club should have. This size of membership, for instance, may be tolerated by athletic clubs. The average club membership should be from 25 to 30.

IX. *Administration*

The administration of the school should make this work as pleasant as possible for the teachers by allowing them latitude in the choice of the subject most agreeable to them. A study club should be provided for students who are not willing to take part in a regular extracurricular activity.

Typical Outlines

Name of Club:	Camera or Kodak Club.
Number Enrolled:	Twenty to twenty-five at option of the teacher.
Fees Charged:	Twenty-five to fifty cents, to purchase materials.
Teacher in Charge:	Any teacher who is interested in picture making.
Requirements for Membership:	Student must own a camera.

*O'Keefe Junior High School, Atlanta, Georgia.

Officers Elected: President, group leaders, shop foreman, treasurer.
Time of Meeting: One period per week. Other fieldwork.

Program

1. Discussion of the work which should be covered in the club. Collection of fees. Election of officers.
2. Cameras. Types owned by the students. Other types.
3. Exposure tables. Use of these tables for indoor, outdoor, and distant scenery work.
4. Field trip taking pictures.
5. Relative merits of roll films, plates, film packs.
6 and 7. Developing and fixing films.
8. Study of papers. Velox, Azo, etc.
9 and 10. Printing and developing prints.
11. Field trips.
12 to 18. Picture taking, developing, printing, and other phases of photography such as sepia prints, enlarging, and coloring.

Name of Club: Home Mechanics.
Number Enrolled: Thirty to thirty-five at option of teacher.
Place of Meeting: Shoproom preferred, or large room with tables.
Teacher in Charge: One familiar with shopwork.
Requirements for Membership: An interest in home problems.
Fees Charged: Twenty-five to fifty cents, to cover cost of materials.
Tools Used: Regular shop tools.
Officers Elected: Leader, treasurer, group leaders.
Time of Meeting: One hour a week. Practice at home.

Program

1. Discussion of problems to be taken up. Collection of fees. Election of officers.
2. Selection of problems. Assembly of materials needed.
3. Division of students in groups. (Electrical, metal, wood, painting, plumbing.)
4. Study of job sheets in each group relating to students problems.
5. Working out of individual problems.
6 to 18. Make changes in personnel of group and work out individual problems.

Name of Club: Sheet-Metal Club.
Number Enrolled: Twenty to twenty-five students.
Place of Meeting: Metal-shop room.
Teacher in Charge: Metal-shop teacher.
Requirements for Membership: Must have advanced credit in metal work.
Fees Charged: Fifty cents as a working capital. Students pay for materials used.
Tools Used: Regular shop equipment.
Officers Elected: President, vice-president, treasurer, foreman.
Time of Meeting: Regular period per week.

Program

1. Discussion of problems taken up. Collection of fees. Election of officers. Suggestions for conducting the work.
2. Selection of the problems, making drawings, and assembling of materials used.
3. Work on individual problems.
4 to 18. Finish of problems.

Name of Club: Furniture-Repair Club.
Number Enrolled: Twenty to twenty-five students.
Place of Meeting: Woodshop.
Teacher in Charge: Some shop teacher.
Requirements for Membership: Must have had two to three courses in woodwork.
Fees Charged: Fifty cents for working capital; charge for materials used by each pupil.
Tools Used: Shop equipment.
Officers Elected: President, treasurer, foreman.
Time of Meeting: One hour a week and after school.

Program

1. Discussion of what is to be included in course. Election of officers. Collection of fees.
2. Collection and discussion of problems and materials needed.
3. Individual problems by the students.
4 to 18. Individual work with the help of the teacher and foreman.

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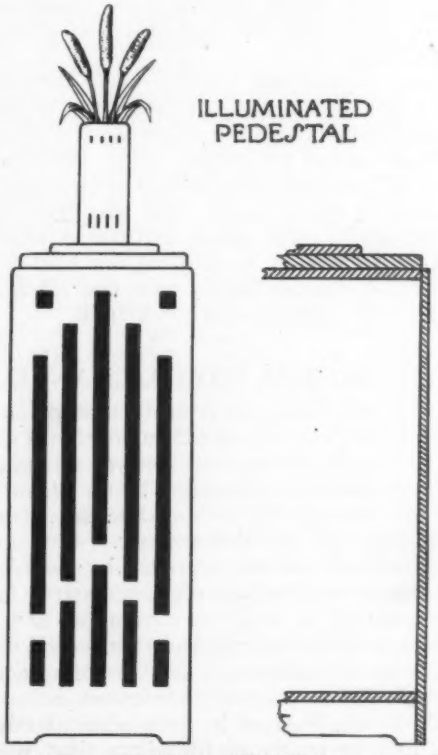

ILLUMINATED PEDESTAL, DESIGNED BY C. A. KUNOU, LOS ANGELES, CALIFORNIA

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

J. J. Metz, Editor

CONTACTS

How frequently is it heard "Why don't the schools use up-to-date methods" and this in spite of the fact that many of the teachers of full-time vocational classes are men who received their trade training in industry and have actually worked as journeymen at their trade.

Probably the main reasons for this is that shop teachers are apt to stick too closely to their jobs. The many duties of the week preclude time being spent on shop visits, and Saturday offers but one-half day for visiting in most industries. Besides this, Saturday is the day on which most of the maintenance work in the school shop is done, hence the teacher must use good judgment in budgeting his time if he wants to have any of it left for keeping in contact with the advances made in the industry which he has left but which he is now teaching in school.

The lightninglike changes which present conditions bring about in industry, however, make it imperative that these contacts be not overlooked. They are not only the means of keeping the teacher abreast of the times, but they also keep him in the eyes of his erstwhile coworkers and bosses. Then, too, such contacts make it easy for the teacher to get practical applications for presentation to his students, and they also open an avenue for the disposal of the product of the school — that is, the boys and girls who are trained for a livelihood.

Teachers of vocational subjects should therefore not overlook this important part of their duty, because the good obtainable through the maintenance of these outside contacts are of the greatest value. The respect of industry for vocational work offered in the schools, and their desire to employ the students who have received their training in these courses and the willingness to submit to the taxation to carry on this kind of work in the school, depends largely upon how efficient and up-to-date the teacher maintains himself.

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GIVING THE BOYS A CHANCE

Much is being done at present in providing ways and means for giving vocational training in the schools. That the avocational interests, however, should not be entirely overlooked is exemplified by the life of James J. McCabe, formerly district superintendent of schools of New York City, who died recently.

While Mr. McCabe was a printer, he studied music and became an accomplished organist. Later on he took up the teaching of music as a vocation, and as an avocation studied mathematics. After a while he became teacher of mathematics and later on school principal, and still later, district superintendent.

While he was engaged in these administrative duties he took up art during his leisure time. When he retired from schoolwork at the age of 65 he traveled abroad and applied what he had learned avocationally about art in a more serious manner so that one of his landscapes, painted when he was 70, was hung in the Paris salon.

Considering his work as a printer, musician, teacher, principal, district superintendent, artist, Mr. McCabe must have led a full and rich life. Our school plants can be put to no better use than to be placed at the disposal of those who want to broaden their lives by following avocational interests. No doubt there are some who will object to this as an expenditure of money for play work. Nevertheless, many will find vocational use for the knowledge which they gain in following avocational studies. This, however, is not all. If we can interest our youth in taking up the right avocational interests, the cost of the educational work will be more than outweighed by the saving which can be effected by reducing the cost of maintaining those in penal institutions who misapply their spare time.

The young men or women who spend their time at school, taking up avocational subjects, besides being on the way to make their lives fuller and richer, will be so interested and taken up with their work that they will have little or no time to come in conflict with the laws.

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PARTNERS

In a recent statement, Earl W. Barnhart, chief of commercial education service, Federal Board for Vocational Education, declares that a permanent educational program, sponsored by trade associations, is essential for professionalizing any commercial occupation. He further expresses the opinion ". . . that a system of instruction developed through the trades will tend to develop the trade literature and bring into the occupation greater efficiency and insight.

"Efforts at instruction by trade associations, he explains, should parallel as well as supplement and coöperate with other educational agencies. The statement follows:

"It is evident that a permanent educational program maintained by a national commercial trade association will be one of the essential steps in improving the operating and managing practices as well as the service standards in that field of business. The effect of this should be more efficient social service to the community. But beyond this there is the greater possibility of developing a professional attitude on the part of the men in the upper levels in the business toward their work."

The advice given by Mr. Barnhart to those engaged in commercial occupations is equally applicable to those engaged in any industrial pursuit.

It can readily be seen that material of this kind will be most valuable, only when it is the combined product of commerce or industry and the school. Captains of industry and commercial wizards frequently accomplish their ends because they instinctively know what and when to do certain things. Usually they do not even stop to analyze carefully everything that is involved in a given line of action. They may not even be interested in how they accomplish certain ends as long as the proper goal is reached.

The schoolman, however, has been taught to analyze and systematize the individual steps that go to

make up a given line of action. He has studied the psychology of the learner and knows how to apply pedagogical methods. It is necessary, then, to have both the practical man and the teacher collaborate in developing this written instructional material because the one knows how to do a thing and the other knows how to teach that thing. It is only when both theory and practice are correctly applied, that the greatest success is achieved. To make the instructional material, which is to be produced for the training of our future commercial and industrial workers as efficient as possible, trade associations and the schoolmen must work together so that the knowledge of the one is supplemented by the skill of the other.

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MARKING SHOP TOOLS

Every school shop has tool losses to a greater or less extent. Some of these losses are due to theft, and it is the aim of every shop teacher to cut down this particular type of loss as much as possible. Of course, extreme vigilance will help in this particular instance, but a momentary let down of the instructor's vigilance is sufficient for the student looking for an opportunity to perpetrate a theft. It may be argued that the student should be so influenced by the teacher that thefts will not occur. Experience, however, shows us that this ideal does not obtain in the classroom and that it is much better to work toward the end that the student will not be tempted to steal — in other words, that he will not have a chance to steal.

One method, of course, is to have the tools so arranged that a glance will show immediately whether all tools are in their place or not. A second safeguard is the proper marking of all tools belonging to the school. The marking may be done in various ways, such as stamping, etching, printing, notching, etc. All of these methods are used, but not every teacher is equipped to do the work so that it does not look more like a disfigurement rather than as a mark of ownership.

Of course, to properly mark tools and instruments, especially those made of metal, requires dies and stamps of various kinds and sizes. To have a true conception of how really troublesome the proposition is, it must be remembered that the stamp that can be used on the slender round portion of a drill or screw driver, will not be suitable on the flat surface of a chisel or hammer head, nor will the stamp that can be used on the latter two, prove useful in marking saws.

It would then seem that this marking of tools is really not a job for the school but that it had best be done by the manufacturer. As a matter of fact, some school boards now insist that the tools they buy are all marked "Property of ..... Public Schools." Of course, this service cannot be expected free of charge from the manufacturer, because the production of special stamps, dies, etc., and the labor expenditure required for this extra service, must be taken into consideration.

The question of providing for this not only more artistic but more satisfactory method of marking tools is worthy of thought, and because of its training value in the school, ought to be considered by both the school administrators and by the tool manufacturers.

—+—

VOCATIONAL EDUCATION

The need for vocational education becomes apparent when we consider that out of approximately four million children who are in our grade schools today, about 17 per cent never get beyond the fifth grade. About 70 per cent enter the seventh grade and about 63 per cent enter the eighth grade.

We hear much about overcrowded high schools and about large numbers who enter high school who ought never to take up high-school studies. Yet only about 34 per cent of these who start in the first grade of our graded schools ever go to high school, and only about 14 per cent of them finish the high school. Seven per cent of those who start out in the graded school enter the college or university and only 2 per cent of them are graduated from these higher institutions of learning.

In other words, at least 66 per cent of these young people have less than even the beginning of a high-school education. When we consider that huge sums of money are required to educate those who want to enter the professions and therefore attend our universities, it ought to be comparatively easy to show the taxpayers the necessity of providing vocational opportunities for the 90-odd per cent who must not only make a living but also contribute toward the education of those who enter the professions.

—+—

INDUSTRIAL CHANGES

According to the information contained in an analysis of industrial progress in the electrical and gas industries of the United States, the National Industrial Conference Board reports that from 1920-28 the number of kilowatt hours of electricity generated increased over 100 per cent, the per-capita increase being almost 80 per cent, and the number of customers' increase being about 115 per cent.

In the gas industry the number of customers increased 34 per cent during this period, the sales of gas, in thousands of cubic feet, 55 per cent, and the number of employees, 32 per cent. While the increase of customers for electricity for domestic and industrial uses has affected the use of gas, the latter industry has not declined, because it developed new uses for its product. As a matter of fact, it has expanded.

While the teacher of industrial arts and vocational education is not especially interested in the gas industry, nevertheless the foregoing shows the trend of industry in general. New inventions and developments seem to presage the death knell of one of the older industries, but with farsighted business acumen the leaders of this industry energetically go about expanding the uses for the material which they are producing, thus not only averting the death of their industry, but rather affecting a revivification of the same.

This phase of alert preparedness and adaptability is another factor which the industrial-arts and vocational-education teacher may not forget. It must be instilled in the students as early as possible in order that they may fit themselves to be ever ready to take advantage of every opportunity which this mobile age may offer at the various stages of their lives.

Establishing the General Shop

*William E. Warner**

Part II

(Continued from Page 290, August issue of Industrial Arts and Vocational Education)

The Superintendent's Interest

School-board members and school officials are oftentimes more interested in the outcomes expected from general-shop work just stated in the discussion of objectives than are shopmen themselves. Besides all of this, the school official is interested in many administrative aspects of the general shop not often included in a discussion of its establishment. These concern problems of number of pupils to be accommodated, time allotment, initial outlay, size of room needed, operation cost, flexibility in relation to the rest of the school's program, kind of teacher needed and what he will cost, as well as a wide range of similar problems. No final answer can be given to the question of how many pupils can be accommodated in any given situation until the specific program for a given general shop is more broadly conceived than at present, and carefully outlined in terms of expected values to the satisfaction of all concerned. A standardized type of work could be taught to an unlimited number of students other things being equal. On the other hand, it may be held that an excellent job of individualized instruction involving psychologically superior students would not be possible in classes averaging more than eighteen or twenty pupils.

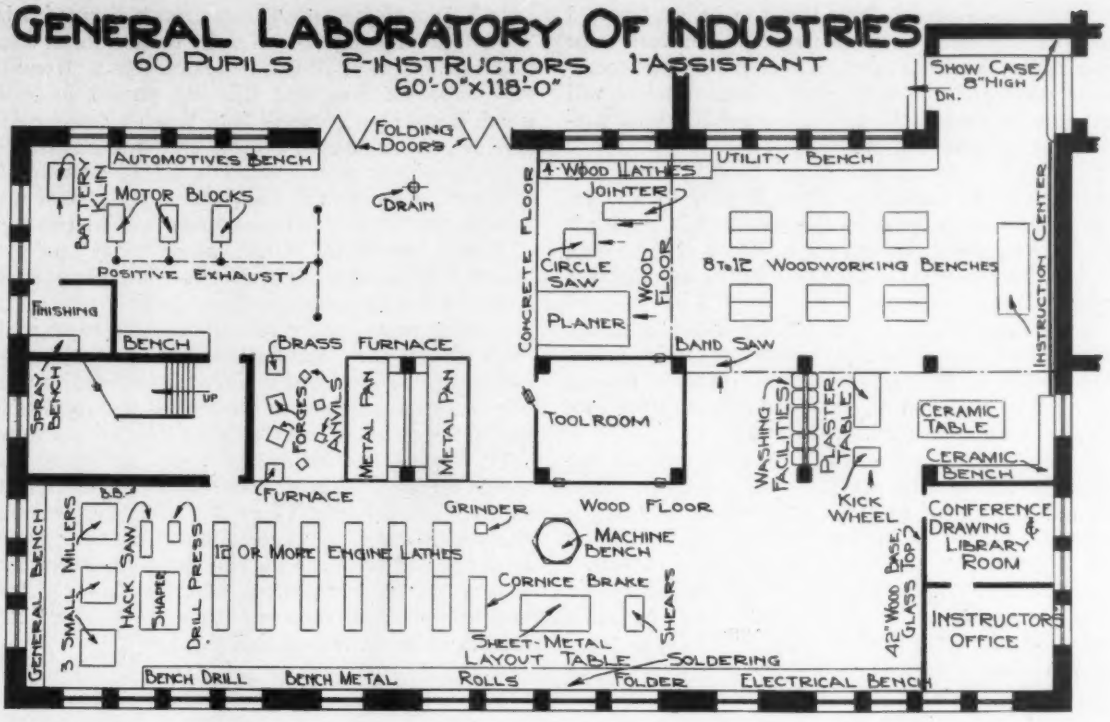
*Associate Professor, Industrial Arts, The Ohio State University, Columbus, Ohio.

What Phases of Industry to Install

Professor G. H. Fern of Texas A. and M. College has ably discussed this topic in a recent symposium on the general shop, during the meetings of the American Vocational Association at New Orleans. He makes sound use of certain educational criteria to control the selection of the various phases of industry which should be included in a general-shop situation.

Undesirable methods of selection, he says, are too oftentimes restricted to: certain administrative demands, production needs of a school system, restricted vocational needs of a given community, equipment for exploitation purposes, expense, nature of equipment already available, and traditional practices. A more desirable basis of selection should be through the use of certain professionally determined criteria. Probably the most important of these would be to make a searching scrutiny of the industrial-arts objectives mentioned in the foregoing, and discussed in greater detail by Snedden and Warner in their book entitled *Reconstruction of Industrial Arts Courses*, particularly on pages 11 to 66. These objectives indicate the specific nature and range of things to be achieved in junior-senior high school industrial-arts work. Attention is again called to the *avocational, exploratory, consumer* knowledges and appreciations, *handy-man* values, and

GENERAL SHOP WORK DONE AT CENTRAL JUNIOR HIGH SCHOOL, LIMA, OHIO
D. Arthur Bricker, Instructor



other equally important purposes all of which should be considered everytime a shop is planned and a piece of equipment is purchased.

Environmental characteristics of the community should in some measure determine what should be included, but in this day and age of rapid transportation and world-wide communication it would seem that such a limited criterion should not entirely determine the breadth of shop offerings in any specific locality.

The four relatively important objectives just mentioned would justify in part the inclusion of the following twenty or more units of industrial work in nearly any larger cosmopolitan school in America today: bench woodworking, cabinetmaking, wood and metal finishing, patternmaking, carpentry, ceramics, electricity, sheet metal, machine shop, forging, masonry and bricklaying, metallurgy, molding, plumbing, printing, drawing, design, welding, textiles, foods, reference and investigational study, and toolroom operation. The criteria growing out of a study of consumption, manufacturing trends, imports and exports, and general census and other economical statistical data, would very quickly bear out the reasonableness of units involving the foods, chemical, and clothing industries — something new in manual-training history.

School officials and shop teachers oftentimes blind themselves to the limited provisions of many general shop installations by adopting the magic word "*exploration.*" Modern industries in any of the phases just mentioned are too frequently far removed and totally unlike the type of drawing, woodwork, sheet metal, and electricity found in actual industrial settings. This fact should cause teachers to take great care in the selection of *representative* types of modern industrial practices and will certainly force them to keep their boys in almost daily contact with various aspects of industries if exploration is really to be achieved.

A progressive trend in practical education demands that shopwork take stock of itself. Teachers and school officials alike may well ask *why* any given unit should be installed and *what* is to be expected from such an investment. Shop teachers cannot longer blink at these professional questions. They are being asked on every hand, and all persons concerned will increasingly consider them before planning a general-shop room.

Planning the General-Shop Room

People have different ideas regarding the arrangement of a general-shop room as is evidenced by any examination of existing general-shop layouts in various parts of the United States. It would seem that a helpful solution to the problem of room planning and equipment layout might be approached through listing certain objectively stated principles which could be used in planning any general-shop situation:

1. *Orientation.* Preferably facing north, but permissible in any direction where an even light is to be had throughout the day.

2. *Room width.* The width of a general shop should not in any way be controlled by the width of an academic classroom of 23 or 24 ft. The two are entirely unrelated. Provision for adequate width may be had through the use of a central or end wing, a separate building, or by combining two classroom widths and a corridor into one room with pillars making a general shop about 60 ft. wide. (See Fig. 1.)

3. *Room length.* This may vary to meet different requirements, or as it is influenced by existing situations. The tendency is for long and wide shops. They vary all the way from 30 to 250 ft. in length. The shop shown in Figure 1 will be 60 ft. wide and 118 ft. long.

4. *Room height.* This should usually be greater than that of an ordinary academic classroom, just as a school gymnasium or assembly room has its own peculiar

requirements. General shops range in height from 13 to 35 ft., depending upon the nature of the work to be undertaken. If a house, garage, airplane, or large ocean-going yacht is to be built, then adequate height will certainly be needed. Normally, in a public school situation, 13 to 18 ft. will do.

5. *On what floor.* The ground floor is preferable, this permits an outside entrance directly to a driveway. However, one prominent school in a large city is placing its general shop on the top floor of a building using a freight elevator for transporting automobiles, equipment, and students.

6. *Lighting.* Natural light supplemented by an approved type of artificial light which will furnish *fifteen foot candles* without shadows 30 in. from the floor in any part of the shop or laboratory. *Twenty-five foot candles* is standard for drawing rooms.

7. *Gas, water, electric, air, drain, and exhaust outlets.* These should be provided where needed. Placement in agreement to other parts of the building is essential, though oftentimes inexpedient because of the length, width, and height in existing situations.

8. *Partitions.* These may well be built solid 42 in. from the floor with reinforced glass for 4 ft. or higher and solid above that point. This would apply to all *auxiliary rooms* placed within the general shop proper.

9. *Nature of flooring.* This is a much-disputed point. Some type of wood floor is to be desired in all situations where it is at all feasible. Some like a "Kreolite" or wood-block floor and this has proved successful where it has been properly laid. When a ceramic kiln, molding, automobile, or cement unit is to be installed, a concrete floor with a drain is highly desirable for that part of the general shop where this type of work is to be placed. It is not uncommon to find two types of floor in one room. In fact, where "dirty" units are involved, different kinds of floors are almost necessary.

10. *Recitation facilities.* Many people insist upon a permanent provision for recitation chairs (with arms) for a general shop, although equally reasonable arguments may be presented for folding steel chairs which can be used in any part of the general shop, and which can be stored in the tool crib when they are not in use.

11. *Bulletin and blackboard* as well as display space should be provided in all places that can be efficiently used for this purpose. There is a tendency toward including an electrically lighted show case near the entrance or just outside in the hall for showing completed projects made in the general shop. The show cases will vary in depth from 6 in. to 4 ft., in width from 3 to 15 ft., and in height from 3 to 8 ft.

(To Be Continued)

Frills and Try-Square

"'Tis a wise father that - -"

"Mr. Frills, I have a very great favor to ask of you," said Try-Square, as he seated himself at his desk for the after-shop class records of a busy industrial-arts teacher.

"Well," drawled the good-natured Frills, "you have known me long enough to know that anything I have from a pipeful of tobacco to a mess of pottage is at your service. We artists do not always know or consider where the next meal is to come from, but we are always ready to share our fortunes and our misfortunes with a good friend. What can I do for you, Mr. Try-Square?"

"This is a matter of advice, Mr. Frills. You know I have a son in your class, and I have often heard you speak of his very good artwork. I could never see much sense in what he did, but he is determined to be a great artist. How he got the notion is more than I can tell! I have had hopes of his becoming a great engineer, but he seems to be a throwback to some temperamental ancestor on his mother's side. At least, I doubt if there have ever been any artists on my side of the family. Now the question seems to be: How can he be a great artist, and at the same time be a self-supporting and respectable citizen? It is all beyond me!"

"Well," again drawled Frills, "I am very much surprised and flattered that you come to me for advice, Mr. Try-Square, but I am mighty glad you have, for there is a good chance that we can make a trade."

"Make a trade!" repeated Try-Square. "How can we make a trade when all I want is a little advice with regard to my son's prospect in art?"

"Well, the fact is, Mr. Try-Square, I have a son of about the same age as yours, although he has a very different disposition. Indeed, it would seem that our sons are somewhat crossed in their family heritage. Mrs. Frills and I have planned since our boy was knee-high that he would be a very great artist, but since he has grown up he has reached the decided opinion that he will be a great engineer. It has been the one disappointment of our married life."

"Well! Well!" mused Try-Square, "what a strange crisscross life seems to be after all! The artist's boy wants to be an engineer, and the engineer's son would be the artist! But your suggestion of trading sons is out of the question, Mr. Frills. I am sure both Mrs. Frills and Mrs. Try-Square would never listen to that, even if the boys were willing."

"Oh! I had no notion of trading sons, Mr. Try-Square. It was only advice I thought we might trade. But isn't nature wonderful, Mr. Try-Square? It surely is a wise father that knows——"

"Yes, so it is! A very unusual and wise father that knows—his own son!" interrupted Mr. Try-Square.

TRACING SUPPLEMENT No. 185,
INDUSTRIAL ARTS AND VOCATIONAL EDUCATION,
SEPTEMBER, 1930

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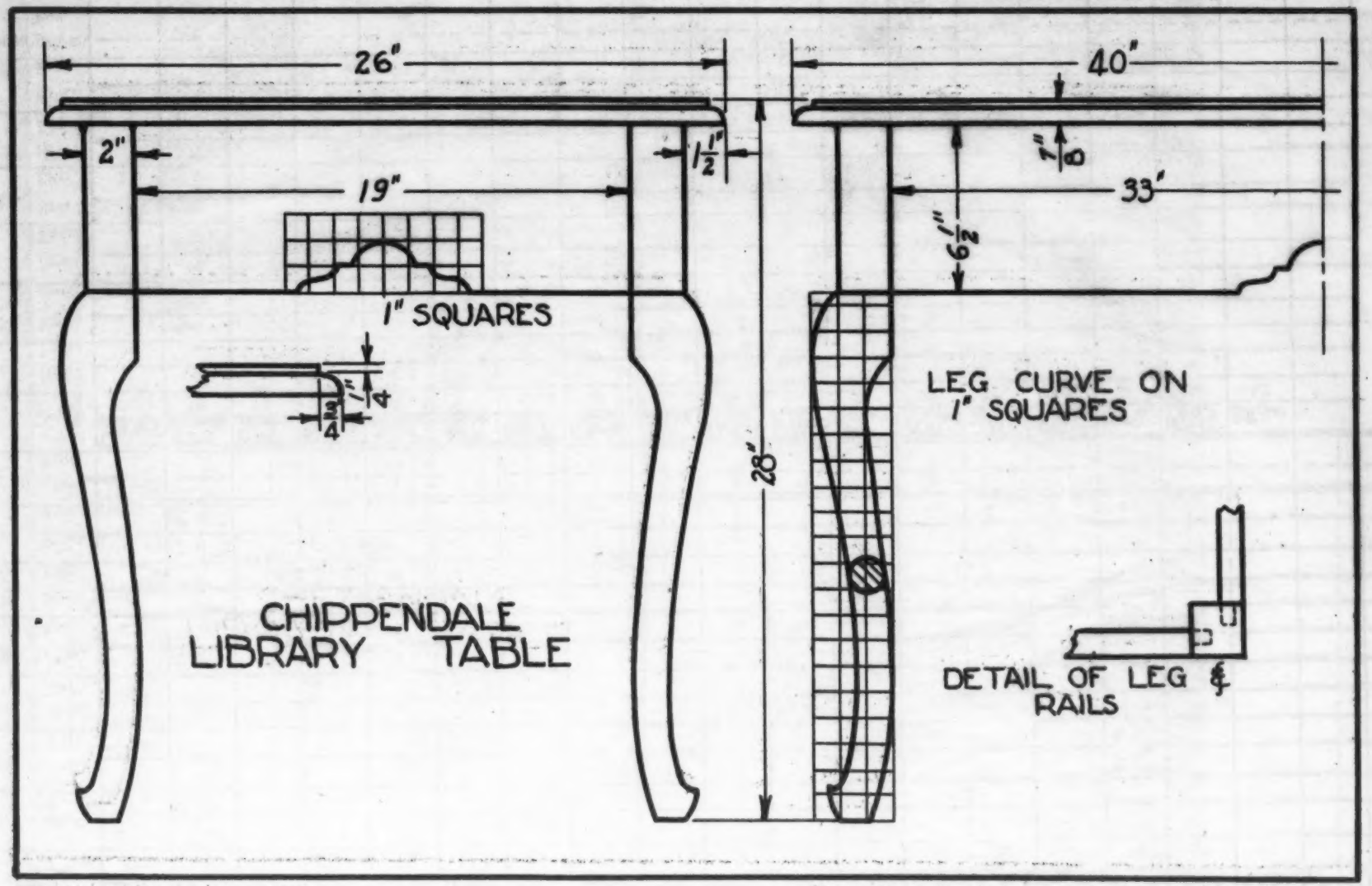
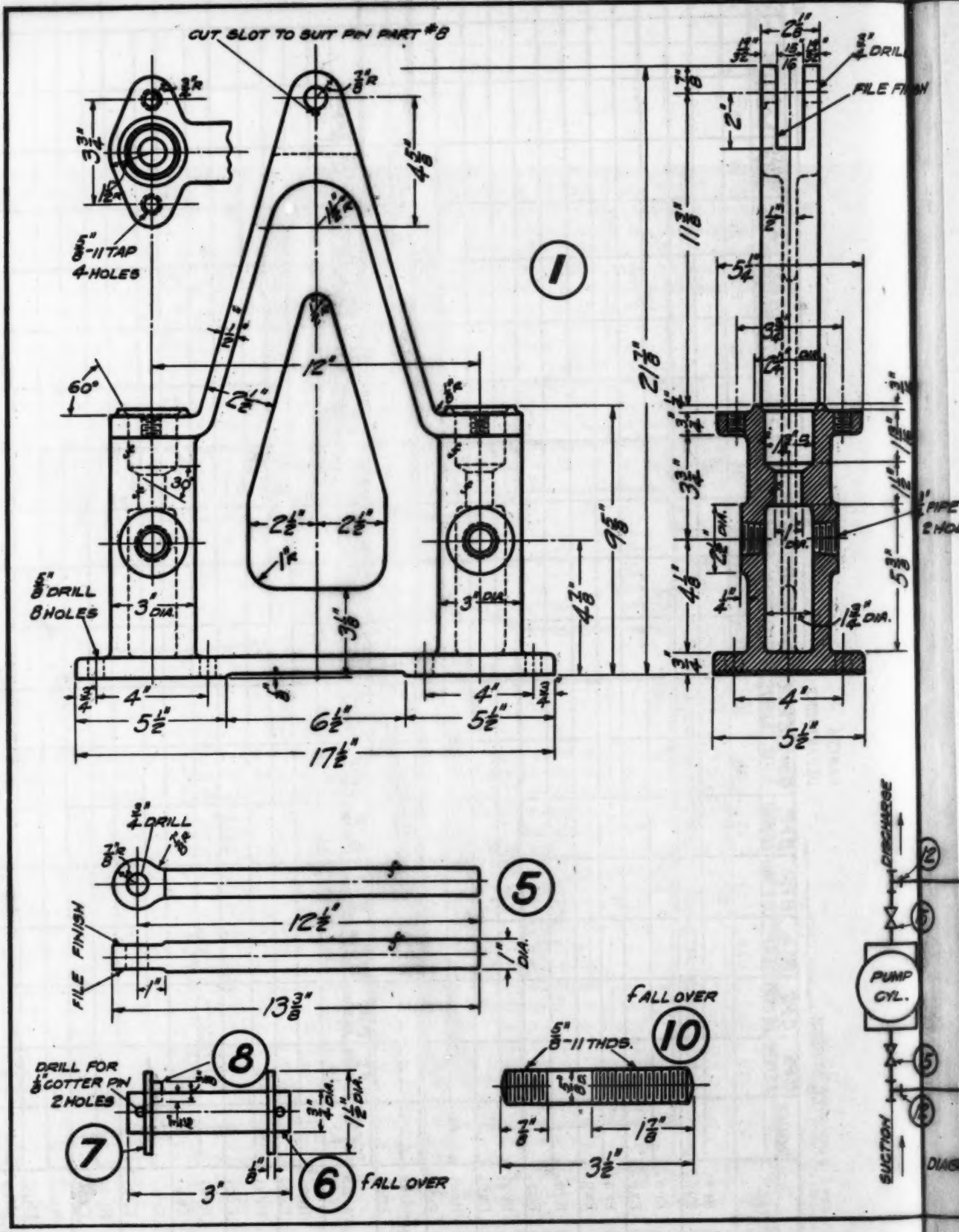


Designed by August Flam, Los Angeles, California

For Description See Page 349, Industrial Arts and Vocational Education, September, 1930



Designed by Paul C. Hooples, Roselle, New Jersey

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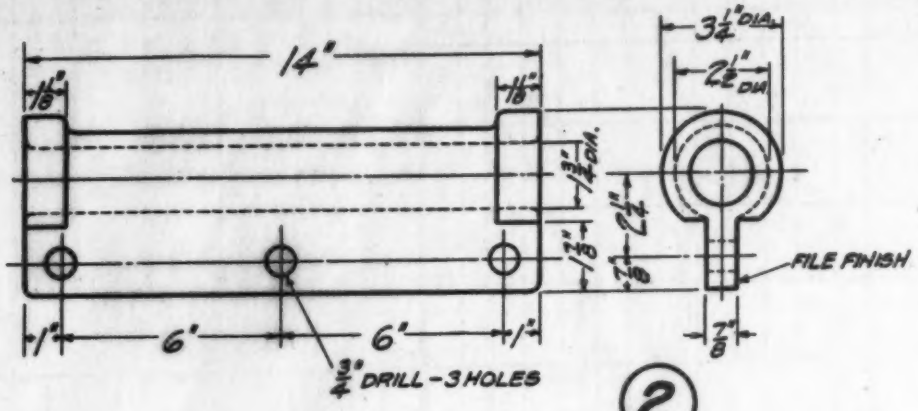

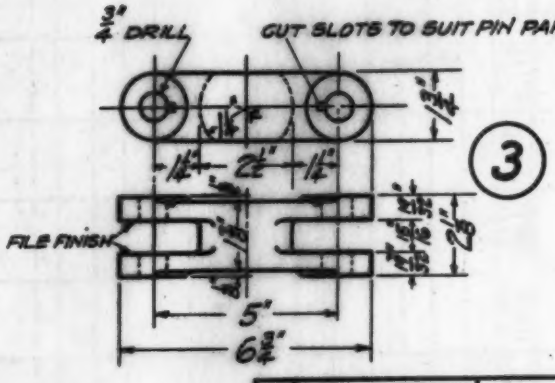

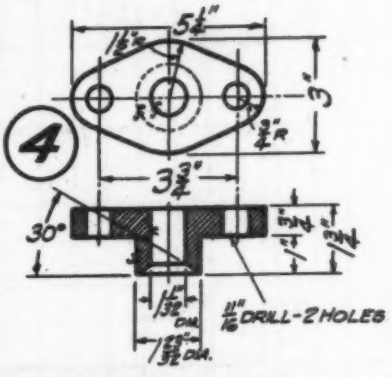

1	WRT. IRON			16	¾" EXTRA HEAVY PIPE 5'-0" LONG
4	BRASS			15	¾" EXTRA HEAVY CHECK VALVE
2	CAST IRON			14	¾" EXTRA HEAVY PIPE UNION
2	CAST IRON			13	¾" EXTRA HEAVY 90° SCR. ELL
3	CAST IRON			12	¾" EXTRA HEAVY SCR. TEE
4	STEEL			11	STD. HEX. NUT ⅝"-11 THD. FOR 10
4	STEEL MCH.			10	STUD FOR PARTS 1 & 4
10	STEEL			9	COTTER PIN ⅛" DIA x 1½" LONG FOR 8
5	STEEL MCH.			8	PIN FOR PARTS 1, 3 & 6
10	STEEL SH.			7	WASHER FOR PART 6
5	STEEL MCH.			6	LINK PIN FOR PARTS 1, 2 & 3
2	CAST BRASS	PATTERN	E	5	PLUNGER
2	CAST IRON	PATTERN	D	4	GLAND
2	CAST IRON	PATTERN	C	3	LINK
1	CAST IRON	PATTERN	B	2	PUMP BEAM
1	CAST IRON	PATTERN	A	1	CYLINDERS

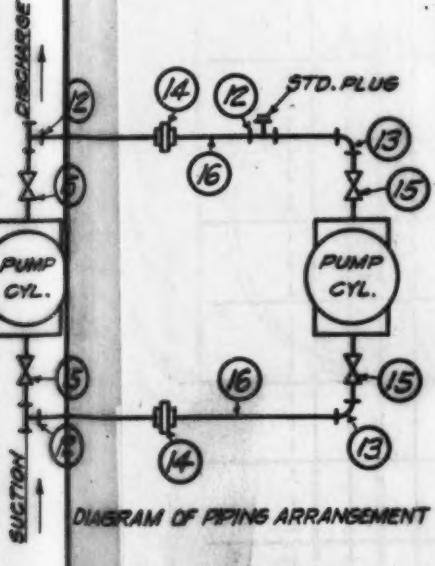

DIAGRAM OF PIPING ARRANGEMENT

HAND PUMP

MADE FOR: MECHANICAL DRAWING COURSE

BEGUN BY:	TRACED:	SCALE: 3" & 6" = 1 FT.
FINISHED:	CHECKED:	DATE:

SMITH & JONES MANUFACTURING CO.,
LOS ANGELES, CAL.

A120

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INDUSTRIAL ARTS AND VOCATIONAL EDUCATION,
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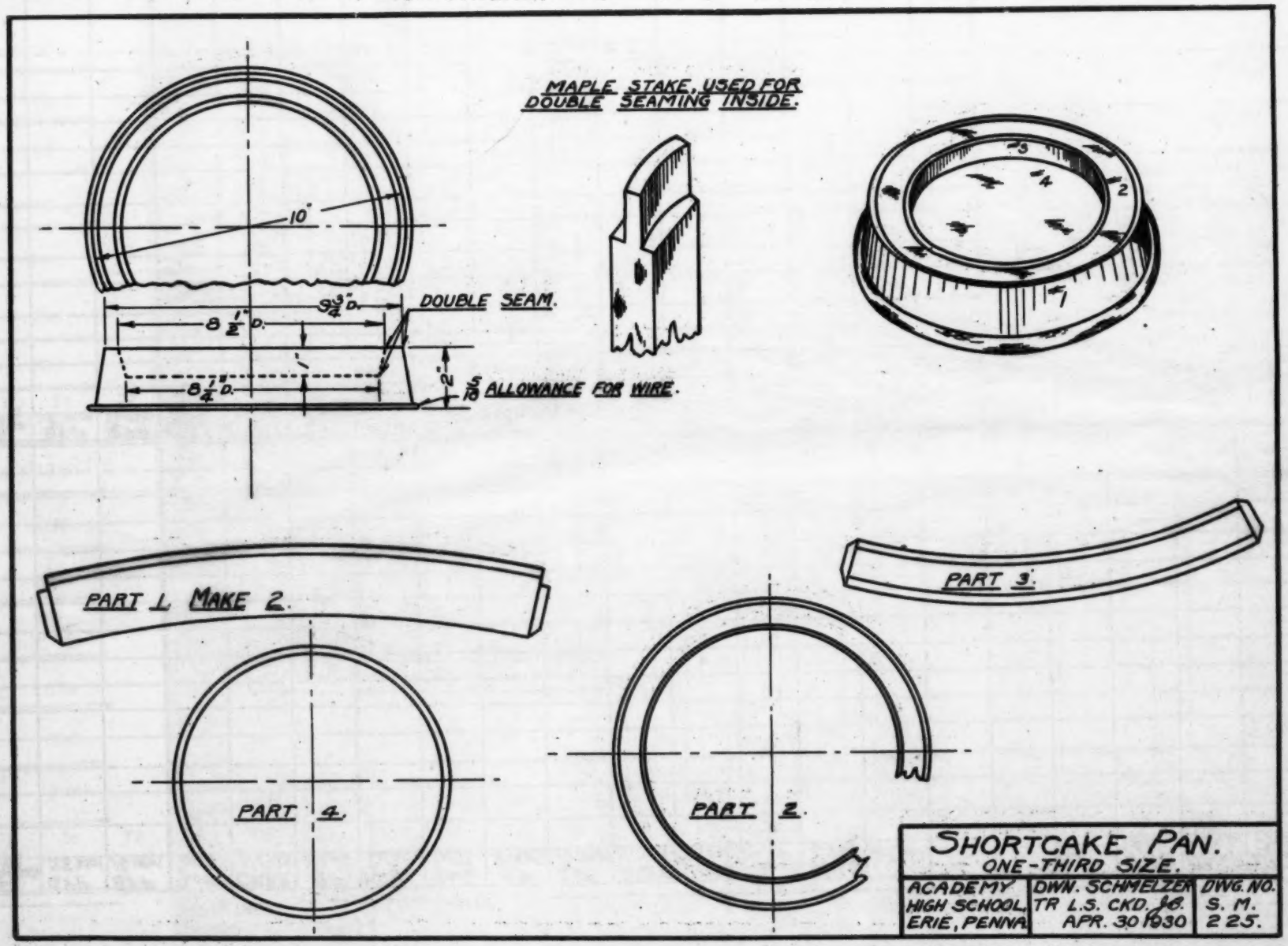


Designed by H. E. Andersen, Erie, Pennsylvania

For Description See Page 350, Industrial Arts and Vocational Education, September, 1930

ADVERTISING PAGES REMOVED

PROBLEMS AND PROJECTS

This department aims to present a wide variety of class and shop projects in the Industrial Arts and Vocational Education. Successful problems are invited and will be paid for. A brief description of constructed problems, not exceeding 250 words in length, should be accompanied by a good working drawing. The originals of the problems in drawing and design should be sent.

Problems in woodworking, turning, patternmaking, machine-shop practice, sheet-metal work, forging, foundry work, auto mechanics, auto electricity, electricity, architectural and mechanical drafting, printing, bookbinding, concrete work, farm mechanics, home mechanics, and other lines of industrial-arts work are desired for consideration.

CHIPPENDALE LIBRARY TABLE

Paul C. Hoopes, Roselle, New Jersey

(See Supplement No. 185)

The work of Chippendale, if reproduced in detail, is usually beyond the skill and ability of the average high-school pupil. The library table described herewith, was taken from and original Chippendale, but it was modified to suit the level of high-school ability. The curve of the leg and the scroll on the rails remain the same, likewise the scotia molding at the edge of the top. The claw foot and shell ornament on the leg, however, are omitted.

The height is, of course, rather low for other than a reading table. If additional height is desired, add to the length of the leg below the rail, arranging the curve to suit. The usual method of cutting out the leg is followed; that is, the layout is made on the two adjacent sides of a piece of square stock. It is then cut out on one side, the scrap from the first cut is put back in place, and then the next cut is made. The rounding is done with spokeshave, rasp, scraper, and sandpaper.

It will be noticed in the detail of the leg and rails that the tenons of the rails have only one shoulder and are mortised flush with the face of the leg. A ⅜-in. thick tenon may be used instead of the ½-in., and a shoulder cut on both sides. However, this places the mortise so close to the face of the leg that there is danger of splitting out during construction.

HAND PUMP

August Flam, Manual-Arts High School, Los Angeles, California

(See Supplement No. 186)

A small, simple hand pump, easily constructed in the usual school shops, and readily adapted to various uses, is shown in assembly in Figure 1, and completely detailed in Supplement No. 186.

Part 1 on the detail sheet is the main casting. It consists of a pair of cylinders connected by means of a central rib, and having a suitable fork connection cast integral at the top, for pivoting the pump beam, part 2. A slotted groove is provided at one side of the fork, for ease in assembling with the pump beam, and also for keeping the link pin, part 6, from rotating. The pin remains stationary, while the pump beam rocks freely on it.

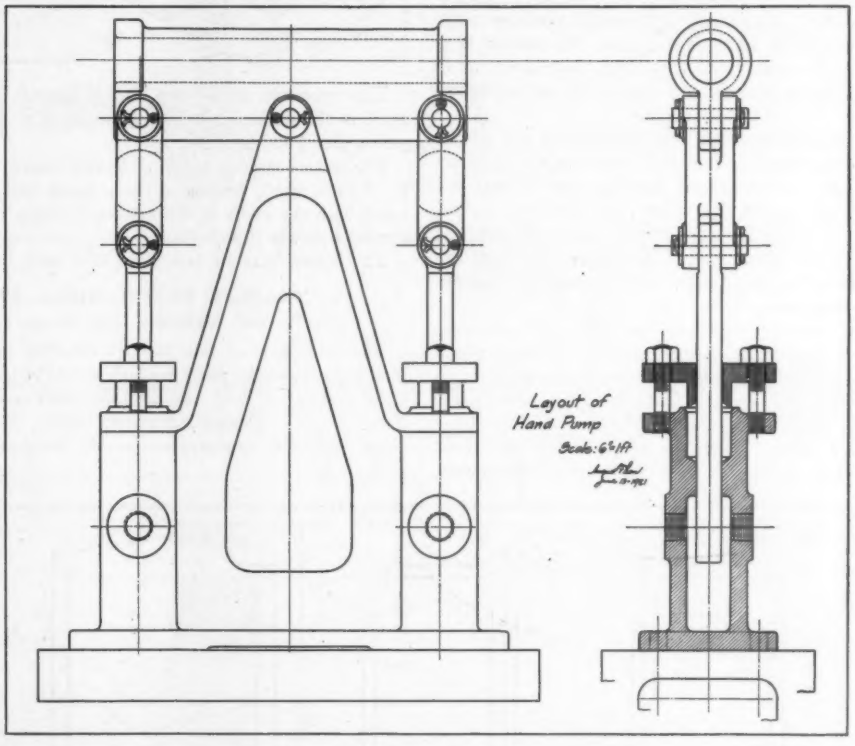


FIG. 1

The link, part 3, is designed to use the same pin, part 6, with washers and cotters in the same way at both ends. Inasmuch as two of these links are used, and the ends are identical, the economy of the design is obvious.

In addition to the center hole, the pump beam is provided with two additional holes close to the ends, to which the

plungers, part 5, are fastened through the connecting links, part 3. Each cylinder is made tight against leakage by means of the stuffing boxes at the upper end of the cylinder chambers, and the glands, part 4, bearing against the packing, not shown. The packing is wrapped around the plungers, and is made to fit snugly in the upper portion of each cylinder chamber. The gland, part 4, keeps the packing tight by means of the two nuts, which can be drawn up on the studs to tighten the packing as it wears down. The studs, part 10, are screwed into the tapped holes in the top surface of the cylinder chambers, and serve as guides for gland, part 4.

The pump is operated by sticking a pipe or bar through the long cored hole in the pump beam, and moving the rod up and down to make the beam rock on the central link pin, and thus work the plungers up and down in the cylinders. When one cylinder discharges, the other functions in suction. Suitable check valves are provided at each side, as shown by part 15 in the diagram of piping arrangement on the detail sheet. While a single person could operate the pump for a brief period, there really should be one person at each end of the rod.

The piping arrangement shown in the detail drawing indicates the number and type of fittings and the manner of connecting up the pump for proper operation. Inasmuch as the part numbers are cross referenced in the bill of material on the detail sheet, further explanation seems unnecessary.

Mounted on a suitable wooden base, this pump provides a convenient, practically foolproof, and readily portable unit, capable of being put to innumerable uses. Its sturdy construction renders it almost indestructible. Moreover, it is inexpensive, and can be built in any reasonably well-equipped school shop.

This hand pump can be used as a problem in the school drafting room, pattern shop, foundry, and also the machine shop. The beginners in mechanical drawing may be required to detail the simpler parts, by using their dividers to find the proportions from the layout. Copying from the finished detail sheets is to be discouraged. The completed details are for the use of the shops principally, and for checking students work in the drawing class.

The pupil who has had two years or more of mechanical drawing, may be expected to design a smaller or larger pump than the one shown in the layout. The proportions for the pupil's design may be copied directly from the print, or the general idea only may be followed, and the design altered considerably. The student layout should be made to full-size scale. The detail drawings which are then made from this layout, should be fully dimensioned so as to be available for the use of the different shops.

SHORTCAKE PAN

H. E. Andersen, Academy High School, Erie, Pennsylvania
(See Supplement No. 186)

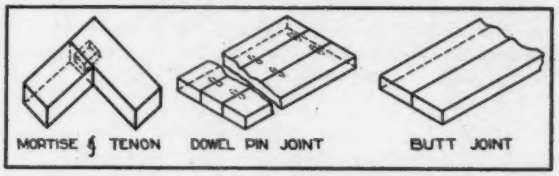
For a double-seaming project, the shortcake pan is a very good one. It involves inside and outside double seaming, also wiring, burring, and grooving. Inside edges are to be turned on the stake by hand. Accurate measurements must be taken and the seams and edges must be turned the exact amount allowed. This project is very useful as well as instructive. It is made of IX bright charcoal tin. The wooden stake used to double seam the inside, is made of maple and may be made in the woodshop.

FIRE SCREENS

Clarence A. Berg, Council Bluffs, Iowa

The project described herewith is easy to make, yet has many applications.

The type of joints used may be either mortise and tenon, or dowel.



The top curve on the two outside screens is made as shown at A, in the illustration. It may be made of one piece or with pieces glued on, as shown.

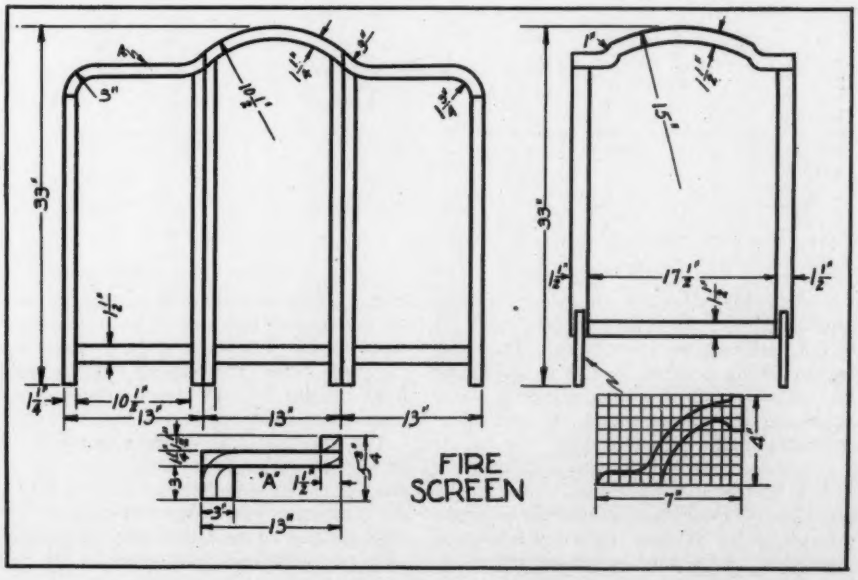
The panels may be made of beaver board, veneer, or cloth. If cloth is used, groove as for a panel and place a strip of wood with the cloth in the groove. Driving the strip into the groove tightens the cloth.

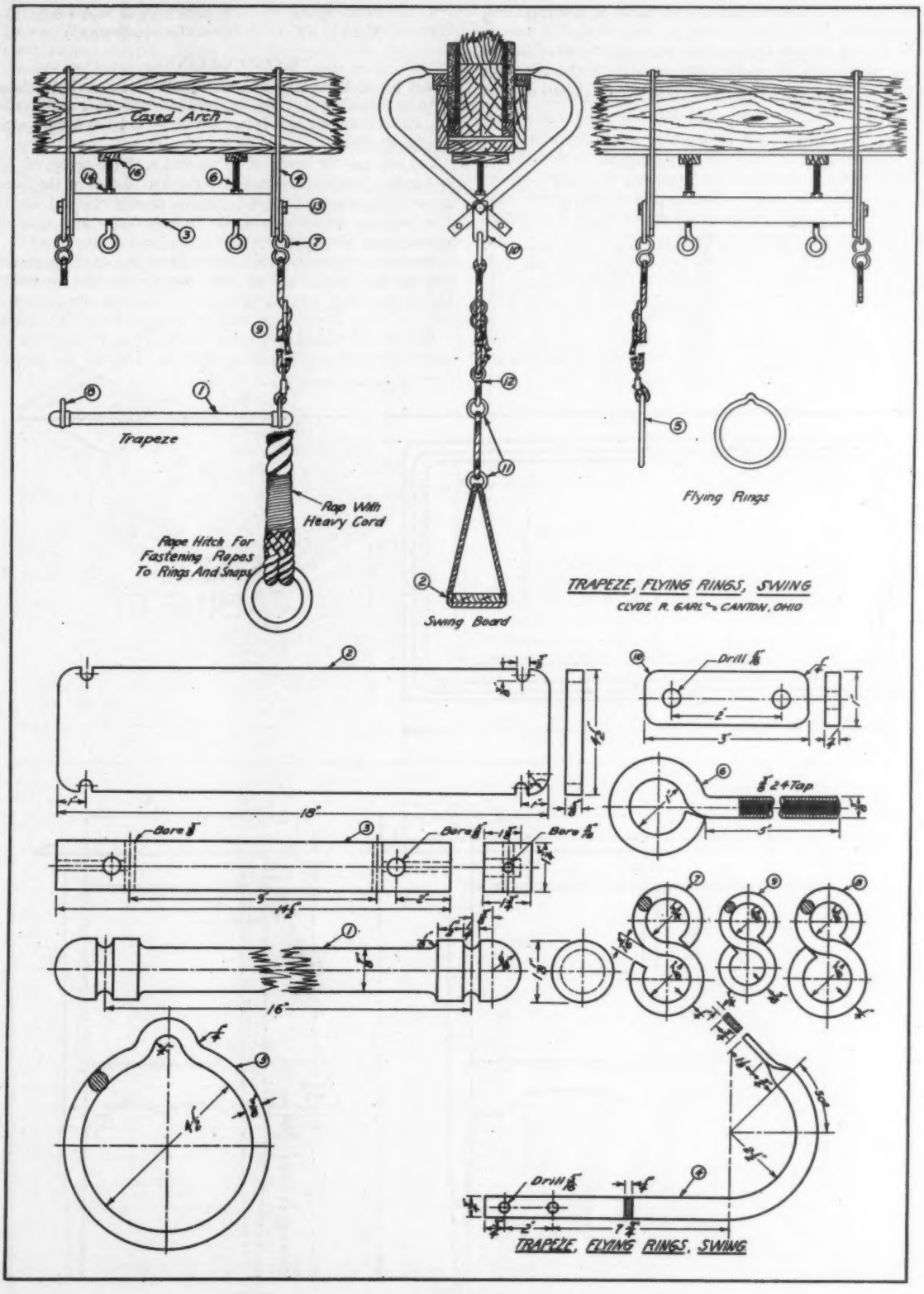
The screen may be left plain or it may be decorated.

TRAPEZE, FLYING RINGS, SWING

Clyde R. Garl, McKinley High School, Canton, Ohio

The designing of this project resulted from an effort to plan a general-shop project which would introduce a relatively large number of tool and machine processes in its construction, for use as a beginning project with a class of high-school boys who are unclassified as to previous experience in shopwork.




Cased Arch
Trapeze
Rap With Heavy Cord
Rope Hitch For Fastening Ropes To Rings And Snaps
Swing Board
Flying Rings
TRAPEZE, FLYING RINGS, SWING
CLYDE R. EARL — CANTON, OHIO
Drill
Bore
16"
18"
TRAPEZE, FLYING RINGS, SWING

This project has some at least of the qualities of an ideal project, which may be considered as one that, first, involves the operations that it is proposed to teach; second, appeals to the interest of the students; and, third, it has real commercial value.

The variety of tool and machine processes involved in this project is apparent from the drawing. Among the processes are forging, welding, drilling, wood turning, die thread cutting, rope splicing, finishing.

Bill of Material

Quantity	*Size*	*Description*	*Piece No.*
1 pc.	1¼ x 1¼ x 18	Trapeze Bar (maple)	1
1 pc.	⅝ x 4⅝ x 18	Swing Seat (poplar)	2
1 pc.	1¾ x 1¾	Cross Beam (oak)	3
4 pc.	¼ x ¾ x 18	Bracket (W.I.)	4
2 pc.	⅜ rd x 17	Rings (W.I.)	5
2	⅜ x 6 shank	Eye Bolts (W.I.)	6
2 pc	¼ rd. x 7	Links (W.I.)	7
2 pc.	¼ rd. x 7	Links (W.I.)	8
2 pc.	3/16 rd. x 6½	Rope Adjusters (W.I.)	9
2 pc.	¼ x 1 x 3	Hinge Plate (mach. steel)	10
4	1¼ st'd.	Harness Rings	11
2	¾ x 3 st'd.	Bolt Harness Snaps	12
2	5/16 x 3 U. S. st'd.	Sq. Head Bolts and Nuts	13
2	⅜–24 tap hex nuts		14
1	24 ft. ⅜ in.	Manila Rope or Sash Cord	15
2	⅝ x 1½ x 5	Protectors (soft wood)	16

RADIO CABINET

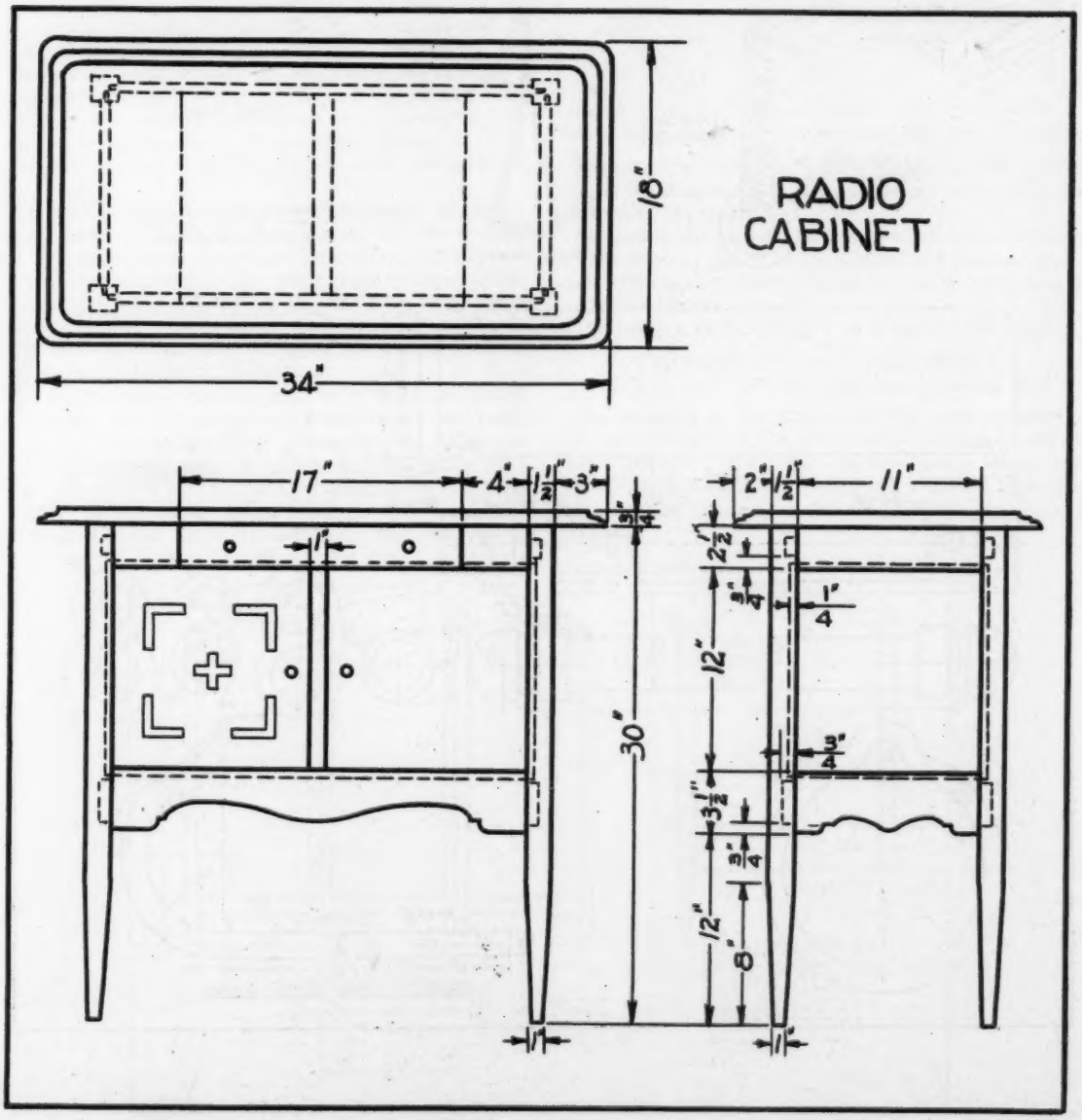
Alfred Sabin, Iowa State Teachers College, Cedar Falls, Iowa

An excellent project for the twelfth grade is a radio cabinet. The one shown here is not too fancy nor too complicated for the student.

The top may be made of either two or three pieces of ¾-in. lumber, doweled together and glued as shown in the illustration. The edges of the top may be merely rounded off, or if a beading machine is available, practically any type of beading may be used.

The front doors may each be made of two or three pieces, doweled and glued together, or a panel door may be made. The advantage of a panel door is that it is more attractive and will not warp. Enrichment may be added to suit the maker.

The drawer shown just below the top may or may not be inserted. It balances the front well and adds to the enrichment of the surface.



Contour enrichment of the lower front and lower end rails should be made to harmonize with the general style of the radio cabinet.

The radio, if battery style, may be placed on the top of the cabinet. The batteries should then be placed in the compartment under the top. Holes for the wires may be drilled through the back with a small drill just large enough for the wires to go through. If the radio is an electric one, it may be placed in the cabinet, and the top may be used for magazines, books, etc.

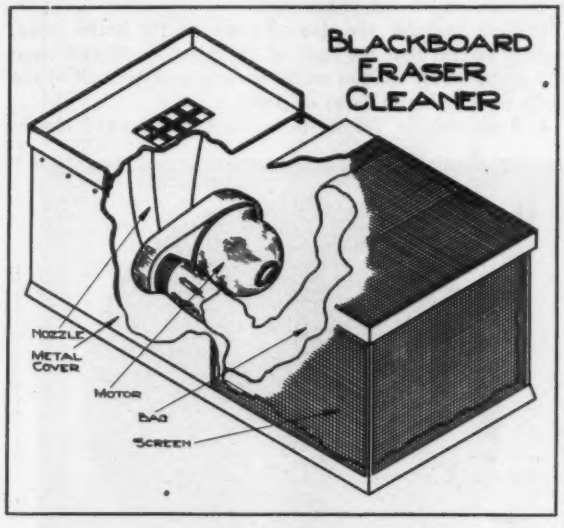
This cabinet is designed as a utility cabinet and finds many uses around the home.

COMBINED BORING- AND TURNING-TOOL HOLDER

C. C. Merkle, Baltimore Polytechnic Institute, Baltimore, Maryland

The combined boring-and turning-tool holder shown in the illustration is a very handy tool for use in the machine shop. The type of boring tools made by forging drill rod may be used, while the ordinary square turning-tool bits may be used in the rectangular groove by swiveling the part A about the pin. All parts should be made of tool steel.

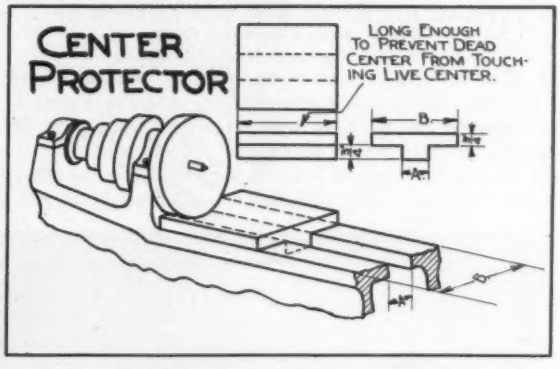
This project presents no constructional difficulties and makes a desirable job for the average school machine shop.



LATHE-CENTER PROTECTOR

R. B. Newhauser, Milwaukee, Wisconsin

The lathe-center protector illustrated herewith is a device which is simple to make, but which fulfills its mission in a very efficient manner. It works equally well on either the wood lathe or the engine lathe and consists of nothing more than a piece of hard wood shaped as shown in the illustration. The dimensions A and B of the piece are made to suit the lathe upon which the device is to be used.

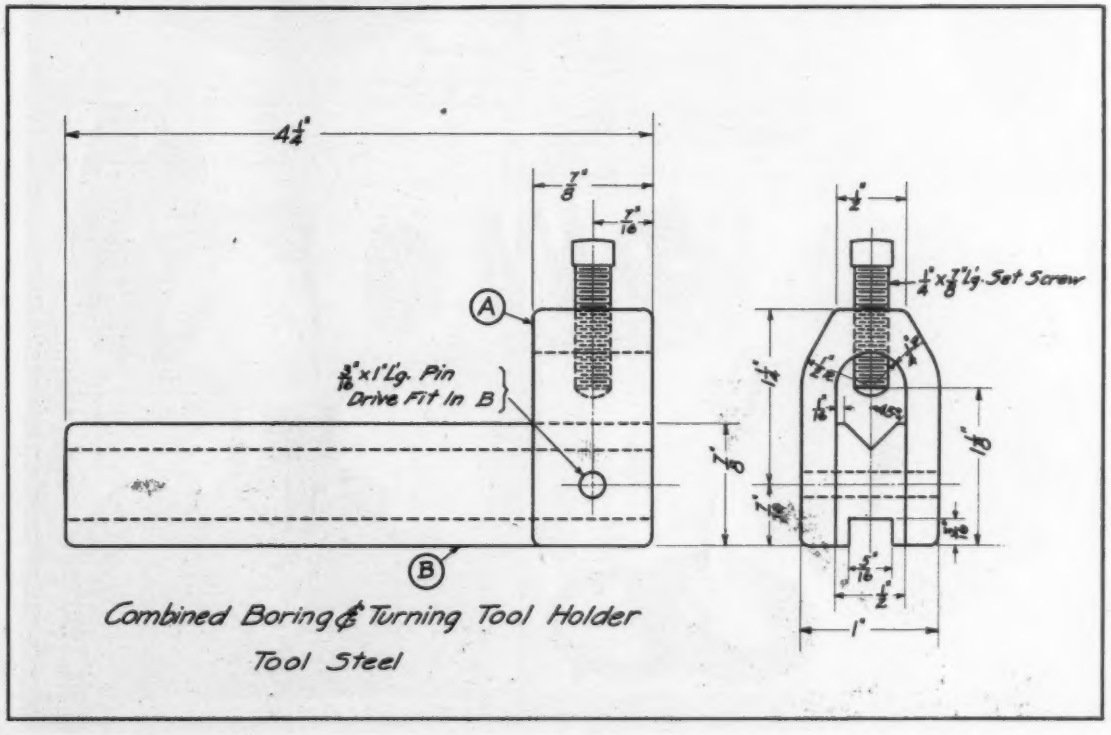


CLEANING BLACKBOARD ERASERS

O. F. Madden, Shaw Junior High School, Washington, D. C.

The cleaning of blackboard erasers is frequently a nuisance in schools, especially when this work is delegated to small children whose common practice is to clap the erasers vigorously upon any available hard surface, whereby they inhale the crayon dust and deface the building.

In some schools this work is being done successfully by vacuum machines, sometimes with attachments that come



with a regular vacuum sweeper and in other cases with specially constructed machines. In schools which have metal shops, it is a simple matter to construct an inexpensive practical eraser cleaner. The base should be of wood with an outside shell of sheet metal (heavy tin or galvanized iron) and wire cloth. A vacuum motor, new or used, is secured to the base, and behind the motor, inside the wire cloth, is the dust bag. It is necessary to construct a special sheet-metal nozzle which can be made in any sheet-metal shop and is bolted to the motor. In cleaning, the erasers are rubbed back and forth over the top of the nozzle, the strong suction of the motor quickly removing the dust.

Such a cleaner is compact and entirely practical and can be used by the little folks or the janitor without the annoyance of flying dust.

TYPICAL JOB SHEET FOR THE AUTO SHOP

Ray F. Kuns, Cincinnati, Ohio

Assembling the Ford Model T Clutch

1. With the transmission in the position shown in Figure 2, the three driven-gear sleeve washers, shown in Figure 1, are inspected for wear. If worn or scored, they must be replaced. Oil them before inserting.

2. Inspect the Woodruff key and the keyways in the transmission shaft and in the clutch drum. All must be in good condition and must fit snugly. Place the key in the transmission shaft end.

3. Drive the clutch disk drum down on the shaft, watching the key to see that it remains in the proper position. Allow .015 to .022 in. play between the washers and the brake drum. If too tight, a blow with the lead hammer on the end of the shaft will loosen the drums. They must turn freely.

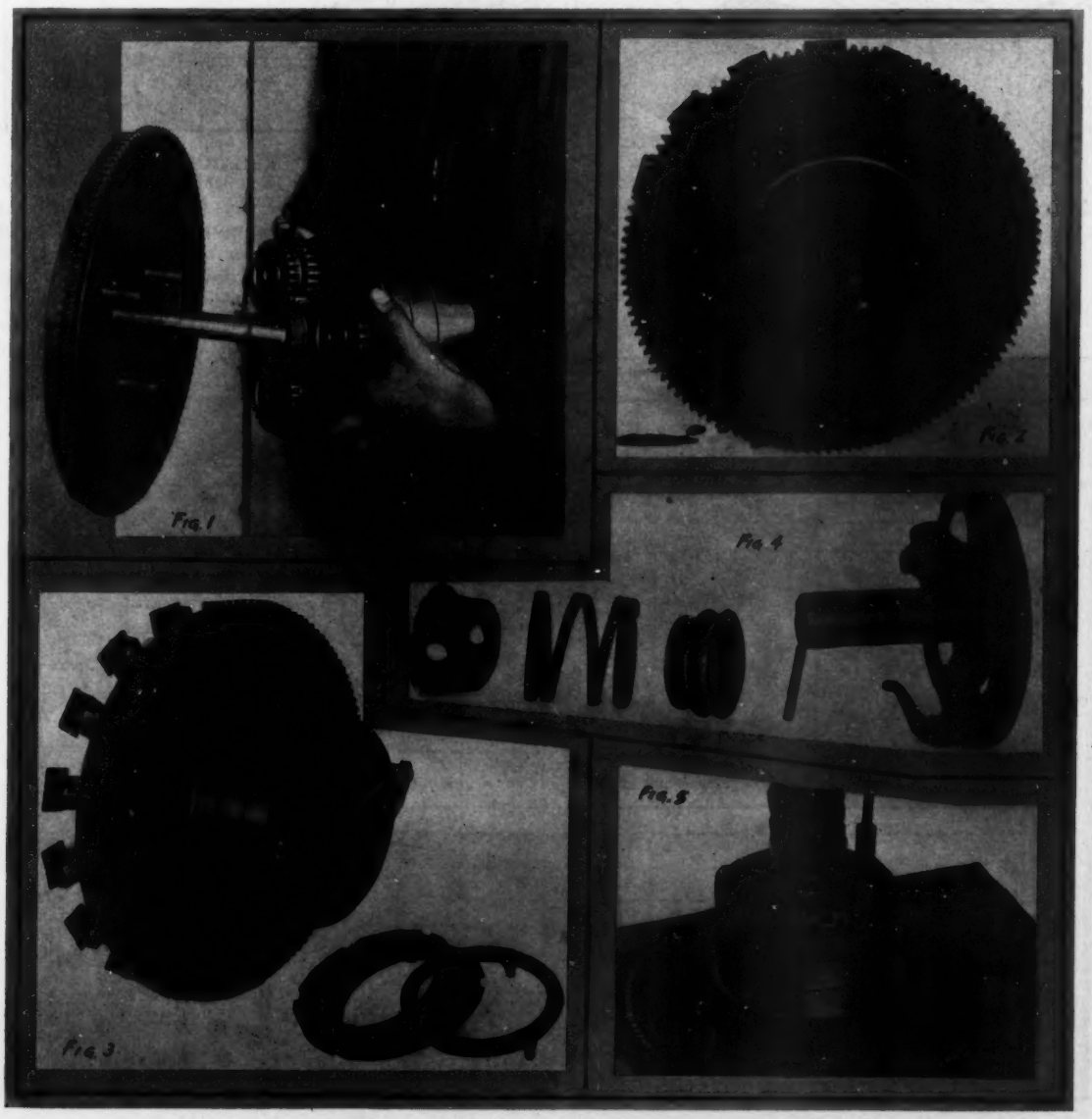
4. Run in the setscrew until it seats snugly, and then insert a cotter key through the head of the screw to lock it. (See Fig. 2.)

5. Secure 13 large clutch disks and 12 small clutch disks, all of which must be in good condition. Never install worn or cracked disks. Start with a large disk, oiling it before installing it and then follow with an oil small disk and continue to alternate large and small ones until all are oiled and installed. The last disk must be a large one.

6. Inspect the clutch push ring (Fig. 3) for cracks, wear, or loose pins. If found to be in good condition, it is installed in position on the last clutch disk.

7. Next assemble the driving plate on the brake drum, making certain that the ends of the adjusting screws come into contact with the pins on the push ring. Run in all of the cap screws and wire them in pairs.

8. Assemble the clutch shift, clutch spring, and clutch-



spring support (Fig. 4) in their proper order, on the sleeve of the driving plate.

9. Use the arbor press or the clutch-spring compressor (Fig. 5) to compress the clutch spring until the pin may be inserted through the hole in the support and the hole in the driving plate sleeve. Then turn the support until the pin slips into the slot. This locks the parts together so the pin may not work out.

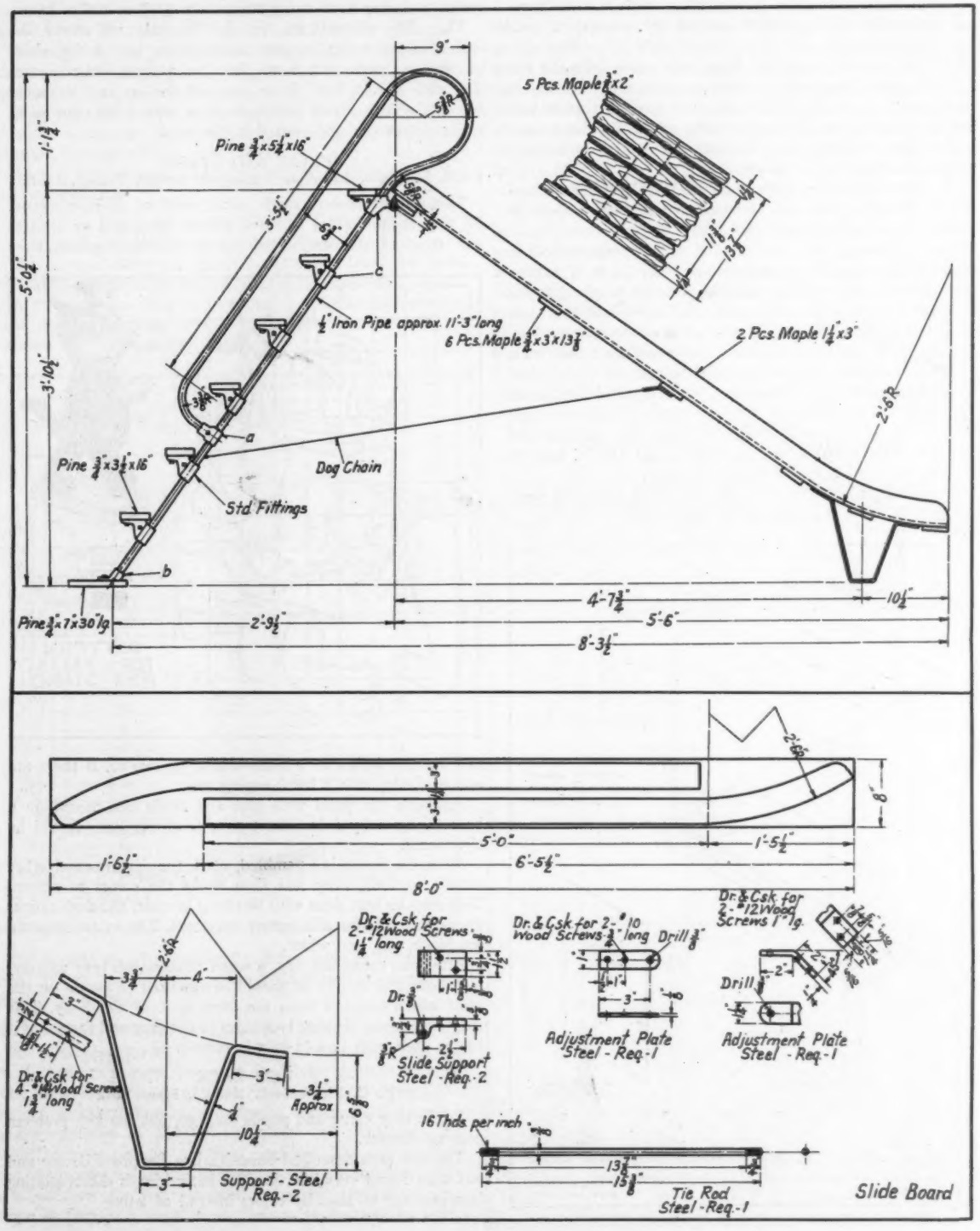
10. Adjust the three clutch finger screws until there is 13/16 in. clearance between the rear side of the clutch shift collar and the drive plate shaft flange. Insert cotter keys through the adjusting screws to lock them.

SLIDE BOARD

J. A. Miller, Director Vocational Department,
New Kensington, Pennsylvania

With the decided increase in traffic, it is becoming more and more necessary to keep the youngsters in a safe place while playing.

Not all playgrounds are so located that children have



access without entailing a dangerous trip across busy and crowded streets.

Assuming that it is necessary to keep the small child at home most of the time, then the home surroundings should be made attractive. The backyard playground is one method of solving the problem and assuring the youngster of as many playmates as the parents desire him to have.

The slide board shown in the accompanying illustration was the outgrowth of just such a problem.

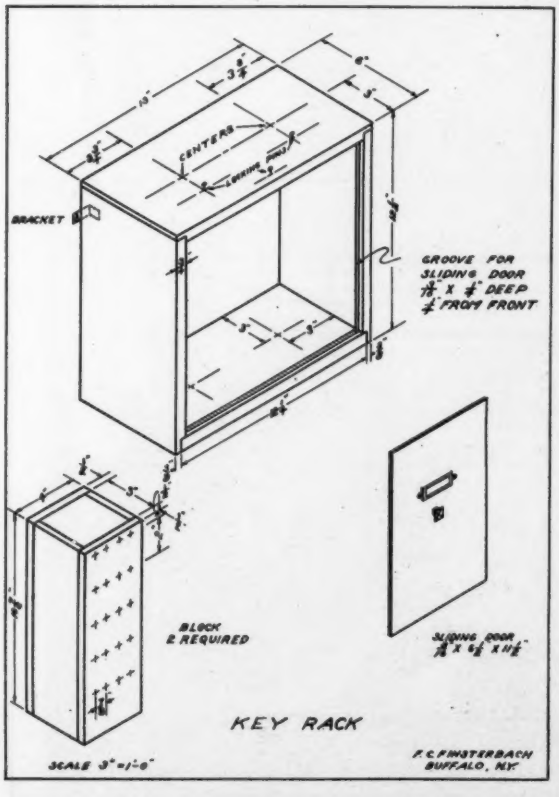
Boys in the woodworking class visited a number of playgrounds, looked over various types of slide boards and from the ideas and information gathered, the slide board shown here was designed. This size is suitable for youngsters from 2 to 6 years of age.

The side rails are made of ½-in. iron pipe. To make the 5⅜-in. bend accurately, a disk, approximately 10 in. in diameter may be used and the pipe bent around it while hot. The 3⅜-in. radius bend is more easily made, but should also be done hot. A layout on a concrete floor will help to keep twisting the pipe out of shape.

The supports for the steps, the base board, and the return part of the side rails are standard articles which may be ordered from a playground equipment company.

It is not likely that any trouble will be experienced in obtaining these parts, but should there be, a ½-in. T and an extra piece of pipe could be used in place of standard fitting shown at (*a*) where the side rails are fastened to the baseboard (*b*) a piece of steel ¼ by 1¼ in. approximately 4 in. long could be used, it being bent in the middle at an angle to suit the job and one end rounded to suit the ½-in. pipe. For step support (*c*), if necessary, a piece of ¼ by 1¼-in. angle iron would serve the purpose. One half of the angle iron should be cut away leaving the part that goes around the pipe in the shape of a rectangle 1¼ by 1¼ in. bent to suit the pipe and bolted through the same.

The side board can be cut from a piece of maple or birch 1¼ by 8 in. by 8 ft., as shown in the details.



There are 6 bottom pieces (maple, birch, oak or other hard wood) ¾ by 3 by 13⅞ in. fastened to the under part of the side and bottom boards by means of No. 10 by ¾-in. wood screws. Three screws (staggered) should be screwed into each bottom piece to hold it firmly, care being taken that screws do not pass through.

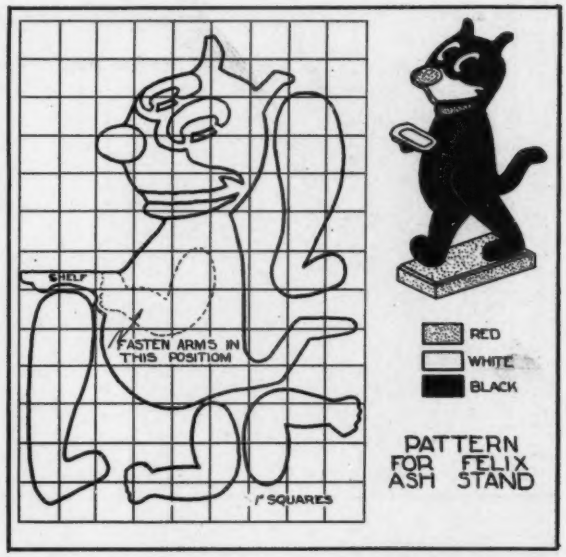
The five bottom pieces can be bent to the shape shown by steaming in an ordinary wash boiler for five or six hours after which they should be clamped to a form having a 24-in. radius. They should remain clamped for at least 24 hours, after which the clamps may be removed allowing the pieces to spring back to approximately a 30-in. radius.

The slide support fits on the tie rod and allows the entire side to swing together when not in use. A dog chain or wire, as preferred, keeps the board rigid while in use. The slide should have three coats of shellac, and it should be well waxed. Paint the iron parts with aluminum paint and an attractive slide board is the result.

FELIX ASH STAND

Frank L. Wade, Brewster Vocational School, Tampa, Florida

This project is very easily constructed of ⅜-in. plywood. All that is required is to mark off the panel in 1-in. squares and transfer the accompanying pattern to these squares. Then



saw out the design on a band saw or jig saw or, if these are not available, with a hand coping saw.

Assemble the parts with glue and brads and mount on a base ¾ by 3 by 6 in. The top edge of the base should be chamfered.

After the figure is assembled, mark the features and other details on both sides and then apply the colors as shown. This may be best done with brushing lacquer, although quick-drying enamel also will answer very well. The colors required are black, red, and white.

After the colors are dry, a small shallow ash tray measuring about 2½ by 3½ in. should be mounted crosswise on the shelf which projects from the front part of the body. This may be done by drilling two holes in the tray and fastening it to the shelf with two ¾-in. r.h. screws.

KEY RACK

F. C. Finsterbach, Buffalo, New York

Pupils may come and pupils may go, but the key problem goes on forever.

The key rack described herewith is a boyproof device and has been found very effective. Its basic idea is differentiating between sets of keys by colors instead of letters.

Each face of the revolving blocks is painted a different color. Keys belonging to a set of drawers are painted to correspond with the face on which they are hung. The handles to the drawers to which the keys belong are also painted the same color as the keys on the block face. For example: From the *red* block face, *red* colored keys are obtained to fit the *red* colored drawers only.

By means of the revolving blocks and the sliding door only the set of keys in use is available to the students, but others are readily accessible for any emergency, such as a change of class or mixed groupings, etc. The key-rack cabinet is fastened to the wall by four small brackets of which one is shown in the illustration. There is no back to the cabinet.

An easy way to paint the handles of the drawers is to remove them (if they are metal) and spray them with lacquer of the proper color.

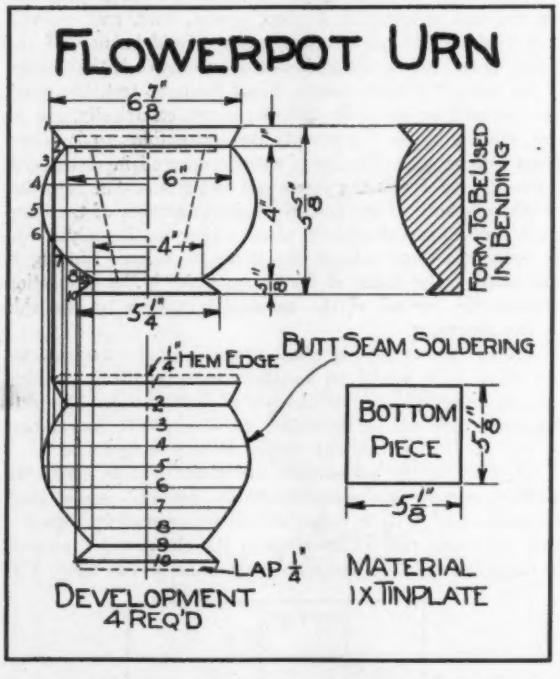
If sheet-metal equipment is available, the block faces may be more compactly made of black iron and the key hooks punched through with a cape chisel.

Place a thin washer under the center of each block for ease in revolving.

SQUARE FLOWER-POT URN

C. F. Haller, Bronx, New York City

This square flower-pot urn is a departure from the usual cylindrical and tapering shapes and has become quite popular with my students. It gives practice in parallel-line development, careful marking, cutting with snips, cornice-brake experience, and butt-joint soldering.



The outside may be enameled a rich orange and the inside black. Where cost is of secondary consideration, copper or brass is preferable.

INDUSTRIAL SCHOLARSHIPS FOR TRADE TEACHERS

The rapid progress made by vocational education within the last decade has brought about an increasing demand in New York state for teachers of industrial subjects. To meet the demand, the state legislature passed a law in 1920, carrying an appropriation of $50,000 to furnish 25 scholarships of $2,000 each to persons properly qualified. The scholarships were to provide tuition and maintenance to the holders, while in attendance on the one-year industrial teacher-training course at the New York State College at Buffalo. In 1925, the law was amended to include women as applicants for the scholarship.

With the passage of the law, a total of 235 men and women in 28 occupations have held industrial scholarships. Eleven of the number have been women. Four trades, including machine-shop practice, electricity, automobile mechanics, and printing were represented in more than half of the scholarships awarded.

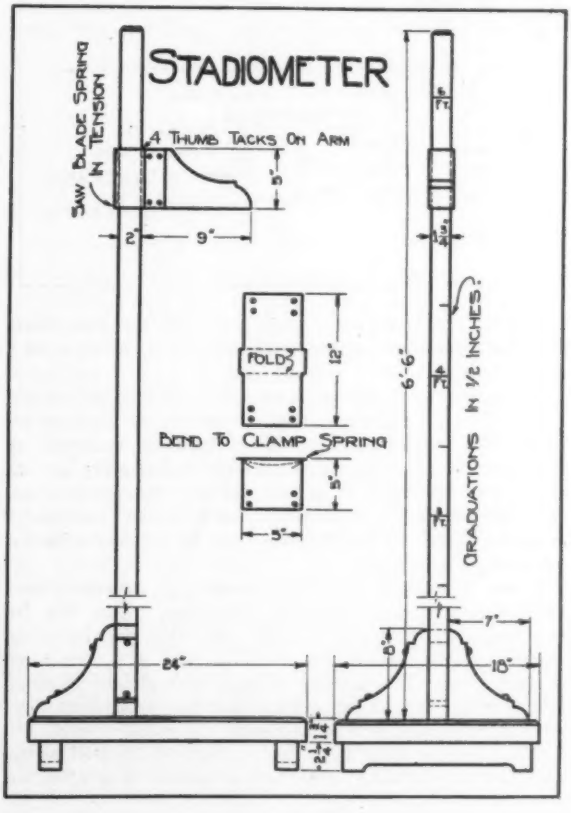
Of the men and women trained under the scholarship plan, it is noted that four fifths of them have entered the teaching profession. All but 8 per cent are teaching in the state, while 5 per cent have for some reason returned to the industry. About 10 per cent are not teaching because of inability to obtain positions in special fields, or because of unwillingness to move to cities where there are vacancies. Five per cent of the applicants proved unfitted for teaching. The mean age of the applicants admitted was 28.5 years. The trade experience averaged between 7 and 8 years beyond apprenticeship, while the education averaged one year of high school, although more than a fifth of the trainees were graduated from the high school, and a small number had college training.

The scholarship plan has accomplished results which justify its continued use. The demand for trade teachers has made possible the placing of 50 per cent of the scholarship holders in schools of the state before graduation. From a state standpoint, the cost of the scholarship plan is justified on the ground that it makes available each year an adequate number of trade teachers for cities where trade-preparatory and apprentice-training classes have been started. Under the plan, a few outstanding men are found each year who give promise of becoming future leaders in the teaching profession.

STADIOMETER

Thomas L. Hutchinson, Central High School, Dansville, New York

Every gymnasium should be equipped with a device for measuring the height developments of the students. The instrument described herewith can be made in the industrial-



arts shop. It must be accurate and it should be so constructed that it can be easily manipulated.

On a stout platform is the measuring rod, 6 ft. 6 in. high. It is made of white wood, and is held by means of three braces, as is shown in the illustration. The braces thus form a backing for the heels to insure correct posture while being measured. The rod is mortised into the platform.

A movable arm is held firmly at an angle of 90 deg. against the upright rod. Four thumb tacks prevent surface to surface contact and thus eliminates rubbing off of the graduations on the upright.

The spring which allows free movement of the arm and yet holds it in place at any position, is made out of an old saw blade. This gives very good tension by its wide contact.

The graduated side is first shellacked and then the lines ruled carefully in India ink. A second coat of shellac is applied so that the brittle ink will not be removed by the rubbing of the thumb tacks.

A piece of No. 20 gauge galvanized sheet iron is used for a strap around the upright rod and is fastened to the movable arm by means of screws, thus permitting its easy manipulation.

This device is doing efficient work. It is accurate, neat in appearance, and well built.

AN IMPROVED 110-VOLT D.C. LAMP-BANK CHARGER

William W. Farley. Philadelphia, Pennsylvania

Where storage batteries are charged from 110-volt d.c. circuits which are subject to interruption, it is often found that during the period of interruption or open circuit the batteries will discharge back into the system causing annoyance and inconvenience due to unexpectedly discharged batteries. An interruption of this sort is a very common occurrence in schools which have private d.c. generating plants. When the engineer shuts down for the night or week-end, he probably will open only the main switch. If any batteries have been left on charge, they will discharge back through any lamps or other devices which are connected to the system. When cold, lamps with tungsten filaments have a comparatively low resistance and it doesn't require many

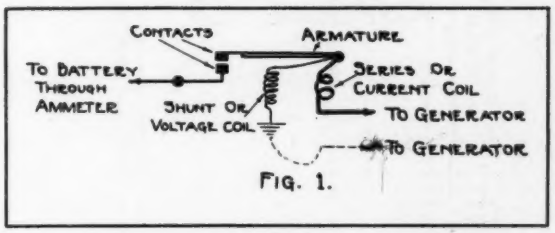


FIG. 1.

in parallel to reduce the resistance to a very low value which will discharge any batteries connected to the line in a very short time.

The remedy is to provide a means of opening the battery circuit when the charging voltage is low or zero. This can be accomplished in several ways. Since expensive contactors or undervoltage circuit breakers are not available for use by the average instructor in an electrical or auto-electric shop, the following method is suggested which will be found to be inexpensive and as efficient in service as a more elaborate piece of mechanism.

A new or secondhand automobile relay or automatic electric cut-out relay as they are sometimes called, can be purchased for less than a dollar and with practically no changes can be adapted for use as a part of a lamp-bank charger. It may be necessary to make several tests in order to determine the proper connections, but beyond that no mechanical changes will be necessary.

There are two coils and a set of contacts operated by an armature on the relay. One coil is known as a series or

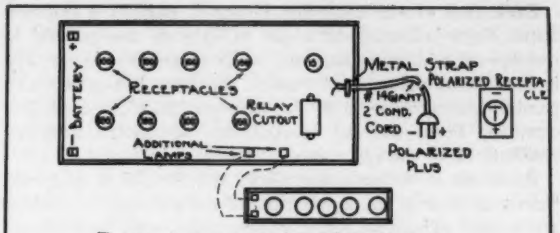


FIGURE 2. LAYOUT OF MATERIALS

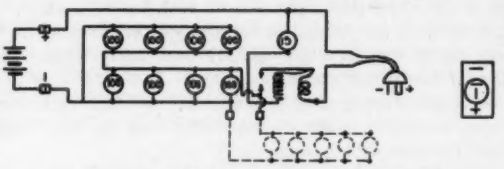


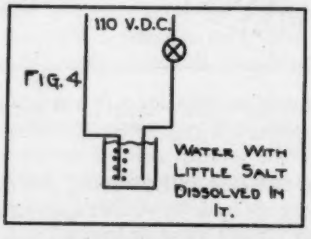
FIGURE 3. ELECTRICAL CONSTRUCTIONS

current coil and has a few turns of comparatively heavy wire (about No. 12 or 14). Underneath this series winding which will be instantly recognized when the cover of the cut-out is removed, is the second winding called the shunt, parallel, or voltage coil. It consists of a number of turns of comparatively small wire (No. 32 or 34).

Probably the simplest testing apparatus to use in determining the two windings is a lamp, socket, wire, and 110-volt source of current. A bell and battery could be used if the spring of the bell or buzzer is not too strong or if the voltage of the battery is high enough. Using the lamp test, the series winding will be the most difficult to test electrically, but as this winding is on the outside the connections to it sometimes can be seen. The lamp when connected in series with 110 volts and across the shunt coil will give a dim light due to the resistance of the coil. Note the brightness of the lamp when it is connected directly across 110 volts. Usually it will be found that one side of the shunt or voltage winding is connected to the frame of the device which is the connection through the ground of the automobile system to one side of the generator.

Figure 1 shows the electrical connections of a typical cut-out relay as it would be installed on a car. It is possible that the terminals may be marked as shown so that the tests suggested may not be necessary. However, it is always best to test, for "things are not always as they seem to be."

Normally in an automobile the shunt coil is connected directly across the generator which delivers, under load, approximately 6 to 8 volts. It will be noticed in Figure 3 that the shunt coil of the relay in the charger is connected in series with a small lamp across the line or 110 volts. This



lamp is necessary in order to reduce the voltage across the coil to about 6 to 8 volts as it would be in an automobile system. The size of the lamp can best be determined by experiment. The rule to follow is to use the smallest lamp that will give satisfactory service to reduce the loss to a minimum and to reduce the heating of the relay coil as much as possible. Too large a lamp probably would burn

out the coil. Usually a 15- or 25-watt lamp will be found to be the correct size.

The number and size of the remaining lamps or resistance units determine the charging rate. It is a good plan to use 100-watt lamps or 100-Ohm resistance units for the approximate charging rate can then be determined without instruments. Each unit placed in the circuit will give a charging rate of approximately one ampere so that the total rate is slightly less than the number of units placed in the circuit. If a greater or higher charging rate than 7 or 8 amperes is wanted, additional lamps or units may be added to the terminals marked "additional lamps." A number of 6-volt batteries can be charged using this device by connecting them in series. This will reduce the charging rate slightly but not so much as when they are connected in parallel.

A polarized plug and receptacles will save time and errors in making connections if the charger is made portable. This will not be needed if the charger is to be fixed in position, for then the connections can be made permanent.

To determine the positive side of the line, the test given in Figure 4 must be made if no d.c. voltmeter is available. This method is accurate and the test materials are always available. The wire connected to the negative pole will have the greater number of bubbles near it. The lamp is used to prevent a short circuit should the two leads be accidently brought together during the test. The lamp may be placed in either side of the line or both sides. One, however, is all that is necessary.

The following list of material will be convenient for checking the materials required for constructing the charger:

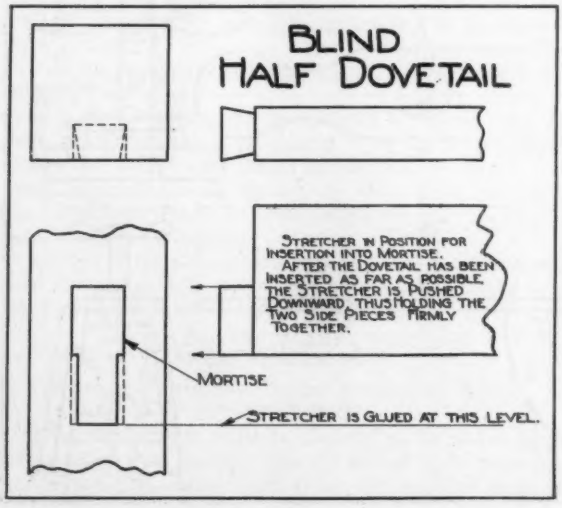
List of Materials Needed

1 board (size determined by number of receptacles)
1 automobile cut-out relay
4 Fahnestock clips, No. 7 bronze
9 or more cleat receptacles
8 or more 100-watt lamps or enameled resistance units, Ward Leonard (100 Ohm), or G. E. Co. Type CR 9006 Form Q S 85, or 122-watt units
1 15- or 25-watt lamp
10 ft. No. 14 giant rubber 2 conductor flexible cord
1 polarized attachment plug
1 or more polarized receptacles
1 small metal strap
No. 14 wire; screws; washers

BLIND HALF-DOVETAIL JOINT

Stephen J. Smith, Snohomish, Washington

This special joint has many advantageous features over any other joint which might be used in its place. It is simple both as to layout and to cut, either by machine or by hand. Both mortise and tenon are simple to execute. It permits the making of a lock joint which will always hold against all strains once it is glued into place. The parts are easily fitted and no clamps are required for the gluing operation.


BLIND
HALF DOVETAIL
STRETCHER IN POSITION FOR INSERTION INTO MORTISE. AFTER THE DOVETAIL HAS BEEN INSERTED AS FAR AS POSSIBLE, THE STRETCHER IS PUSHED DOWNWARD, THUS HOLDING THE TWO SIDE PIECES FIRMLY TOGETHER.
MORTISE
STRETCHER IS GLUED AT THIS LEVEL.

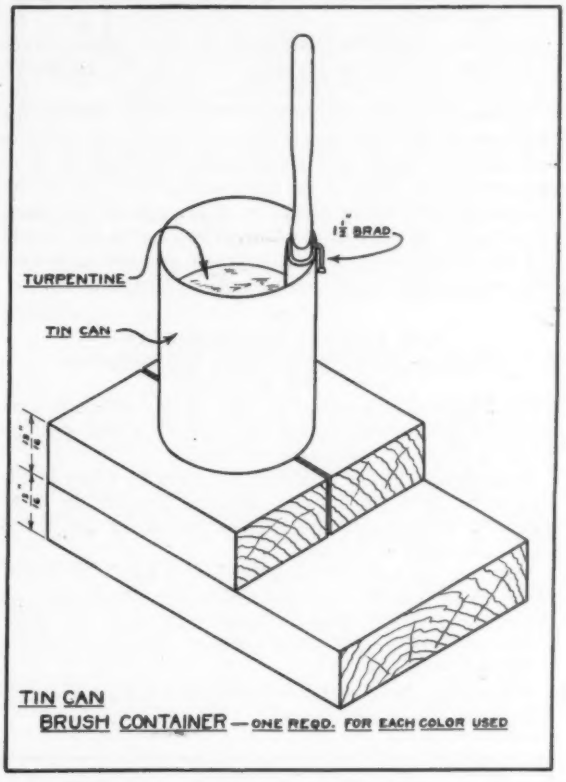
Half of the dovetail tenon is cut away and half of the mortise is cut away. The square mortise first receives the tenon, then the latter is dropped into place.

TIN-CAN BRUSH CONTAINER

Jos. J. Lukowitz, Milwaukee, Wisconsin

A good brush container for the school shop is a necessity that must often be supplied by the ingenuity of the instructor.

The container shown in the drawing has several commendable features. It keeps the brushes clean, and consequently also the paints and enamels clear in color. There is less danger, for example, of getting black paint into the green by using the wrong brush. The container is not easily tipped, it can readily be moved from place to place, it occupies very little space, and it is easily cleaned. It can be quickly and easily made and it costs nothing. The wood base and the can may be painted the color of the paint, enamel, lacquer, or finish the brush is to be used in.

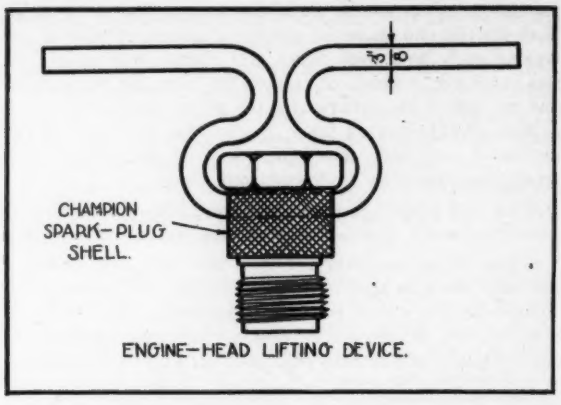


The author believes that the use of such devices as this in the school shop cannot help but develop in the boys some understanding and appreciation of the importance of system and order. It has been found that boys coöperate in this sometimes vexing problem of the care of brushes in the school shop when simple, reasonable, and adequate means are provided for the care of the brushes.

ENGINE-HEAD LIFTING DEVICE

John E. Quick, E. Cleveland, Ohio

Engine heads that are held to the block by stud bolts are often difficult to remove because of the binding of the studs in the cylinder-head holes. The following lifting device, which can easily be made in the shop, enables the repairman to secure a hold on the head in such a manner that it can be



raised evenly and easily. The device also provides a means of attaching a chain hoist for removing heads when the gasket has been shellacked or the stud bolts are rusted.

The lifter is made by drilling a ⅜-in. hole through the upper part of the shell of a Champion spark plug after the core and packing nut have been removed. A piece of ⅜-in. iron rod is then placed in the hole and bent as shown in the illustration. Two lifters should be made, one for the front and one for the back of the head. They should be screwed into the spark-plug holes securely before any pulling is done with them, or the threads in the head may be damaged.

THE KINDERGARTEN SEESAW

Merlin J. Finch, Supervisor of Industrial Arts, West Orange, New Jersey

The kindergarten seesaw, described in this article, is compact, has no movable parts, and may be safely used by youngsters without constant supervision.

A rough sketch of the device was given to a boy in the sophomore mechanical-drawing class, and he made the drawing and tracing from which the blue prints for the junior-high-school shop were made.

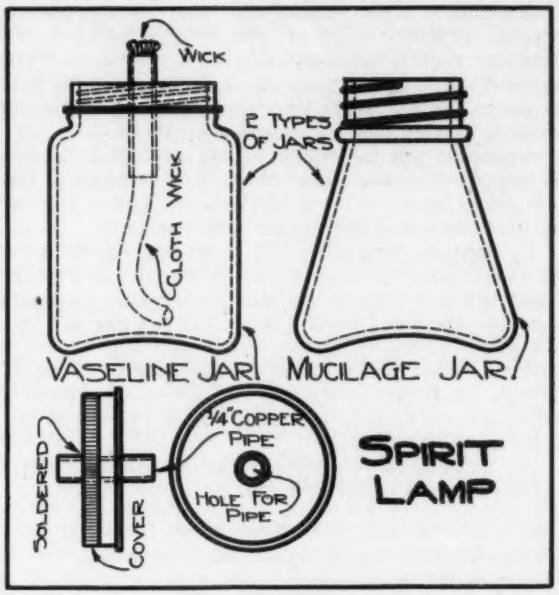
Three boys volunteered from the junior shop class to construct the seesaw. Oak was used throughout. The screws were sunk below the surface and plugged with ½-in. oak plugs. The rockers were spread at the bottom to prevent the seesaw from tipping sideways.

In finishing, the rockers were painted red and the rest varnished after a thorough sanding.

SPIRIT LAMP

Carl v. Lindeman, Western State Teachers College, Paw Paw, Michigan

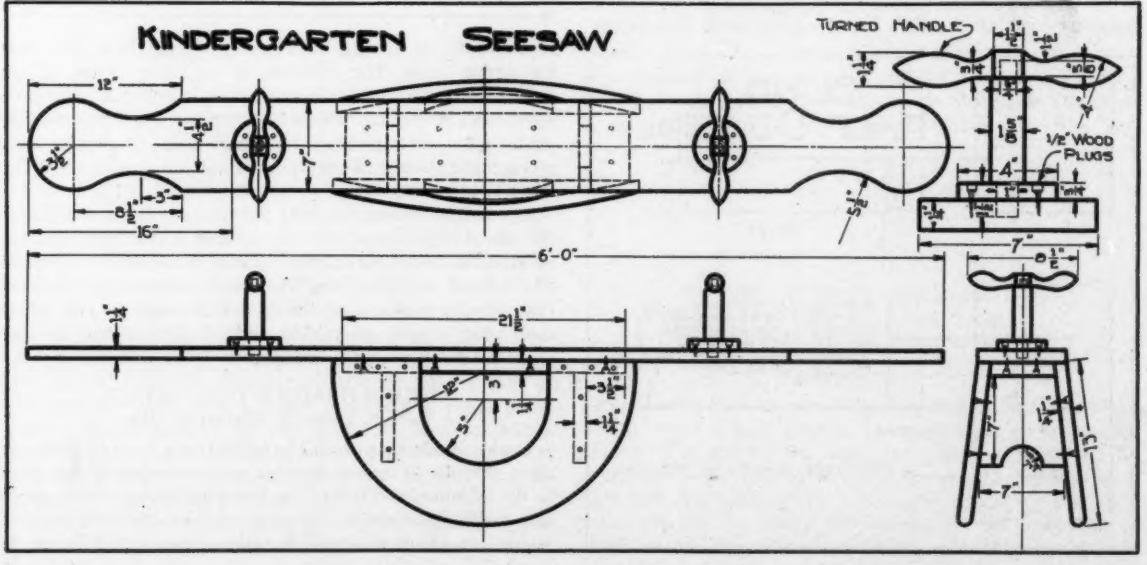
A very useful article and one that is very often used in the homes and shop is the Spirit Lamp. It becomes very useful in the school shop for melting stick shellac and heating bamboo for making small airplanes and the like. The spirit lamp may be made from any small jar with a screw cover, but a small vaseline or mucilage jar is preferable.



The lamp is constructed by drilling a small hole ¼ in. or larger if a larger piece of pipe is used. The pipe is soldered to the top leaving the tube project about ½ in. from the cover, as shown in the illustration. A small hole, the size of a pin, is punched at one side of the cover to let in the air. The wick is made of a piece of cloth wound around and placed through the pipe. Alcohol is next placed in the lamp taking care not to fill the jar too full. The lamp is then ready for use.

PROGRESS OF AGRICULTURAL EDUCATION

Agricultural education in the United States has become exceedingly extensive and complex. The development of the sub-

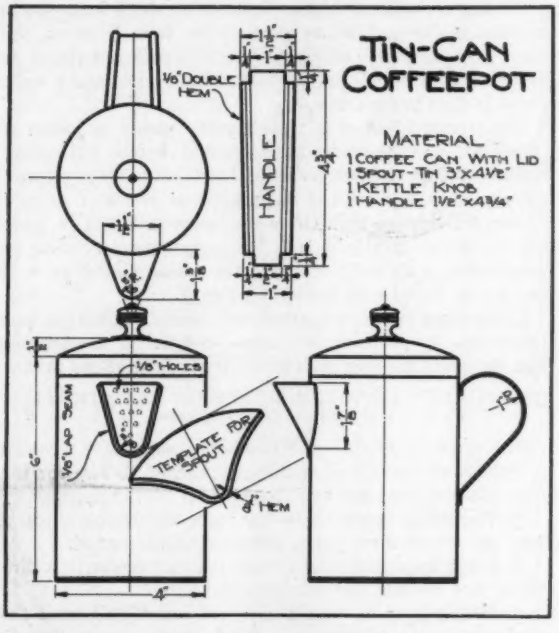


ject in the past forty years has been presented in detail by Mr. Alfred C. True, formerly specialist in states relations work of the U. S. Department of Agriculture, in a pamphlet entitled, "A History of Agricultural Education during the period 1785–1925, just issued by the Government Printing Office. The pamphlet shows that during the period from 1820 to 1860, there was developed a definite movement for agricultural education in the country. The teaching of agriculture in private institutions was attended with small success, so the advocates of the movement turned to the federal and state governments for help. The movements in New York, Illinois, and Michigan, led to the establishment of two types of institutions, namely, separate colleges and branches of univertities. In the period following 1873, the overproduction of agricultural commodities and the depression of values, deterred young men from entering the courses in the colleges. From 1900 on the popularity of agricultural education increased rapidly, so that today the subject emphasizes the fundamental importance of vocational subjects, while giving a broad foundation training in scientific and cultural subjects.

TIN-CAN COFFEE POT

Nicholas De Cesare, School No. 94, Baltimore, Maryland

This is one of the many interesting and very useful projects that can be made from tin cans. It is especially interesting to Boy Scouts. The best cans to use for the project are coffee



cans of 1-lb. capacity, dimensions generally 4 in. in diameter by 6 in. high.

The job consists of attaching a spout, handle, and kettle knob to the tin can.

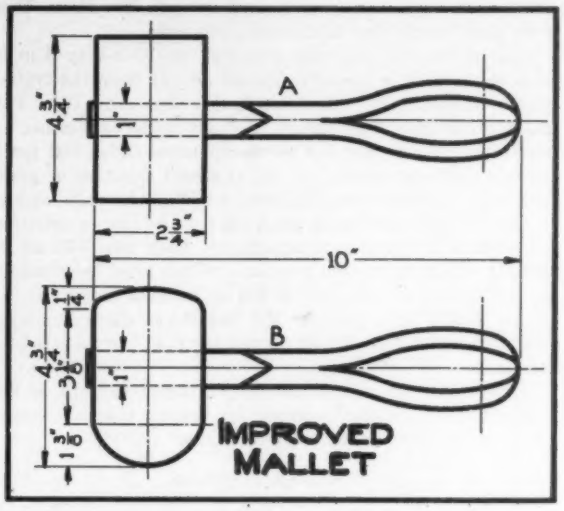
In making the spout, the piece should be formed over the horn of the creasing stake. Burr a ⅛-in. lap for soldering. The outline of the spout should be scratched on the can. The spout should be directly opposite the seam. Mark and punch the ⅛-in. holes. Solder the spout to the can. The handle presents no special difficulties.

The top of the can is raised by placing the raising hammer in a vise and striking the lid with a mallet. The adding of a kettle knob "tops off" the project very nicely.

AN IMPROVED MALLET FOR THE SHEET-METAL SHOP

Joseph A. Miecikoske, Munger Intermediate School, Detroit, Michigan

When the ordinary mallet is subjected to the severe usage of the school shop, its edges soon will become badly splintered and ragged. The mallet described herewith has been designed



for the purpose of overcoming this difficulty. These mallets may be turned up in the wood-turning shop.

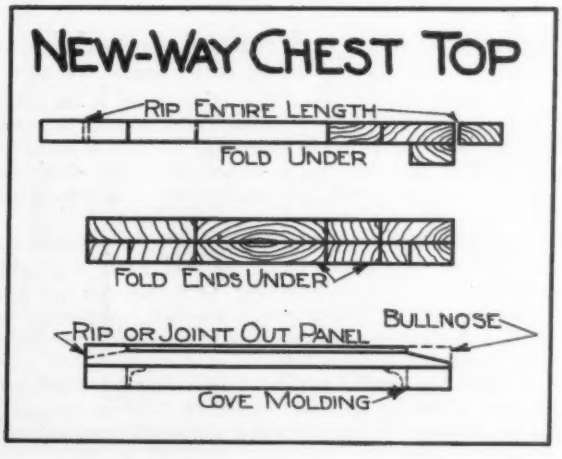
In Figure A is shown the type of mallet that is usually bought and which does not stand up well in class. At B is shown a mallet with rounded edges, one face semicircular, while the other is rounded slightly. This type has been found to be very efficient in the school shop and they stand up very much better than the common type.

THE NEW-WAY CHEST TOP

Stephen J. Smith, Snohomish, Washington

A method of combining both the greatest possible utilization of board measure content and beauty of grain composes the idea responsible for the development of the New-Way Chest Top. The waste of material is reduced to a minimum, for the usual waste in trimming is utilized not only to add to the strength of the top, but to the beauty of it through making such cuts and utilizing them to perfectly match the grain of the wood around the entire top.

This process adds considerably to the strength and durability of a chest top. The panel effect obtained as illustrated does not weaken the top appreciably, for where ¼ in. of material is cut away above, ¾ in. of material is added below. Another structural strength feature gained in utilizing this type of top construction is that the grain in the pieces folded under around the edges of the top and glued, as illustrated, is in this position directly opposite of that of the pieces above. Thus the tendency to warp is checked with but a slight variation in any direction. So many tops are designed to add considerably to the beauty of the finished product, but at the



same time a real loss in structural strength is evident. This idea adds beauty and it also adds strength.

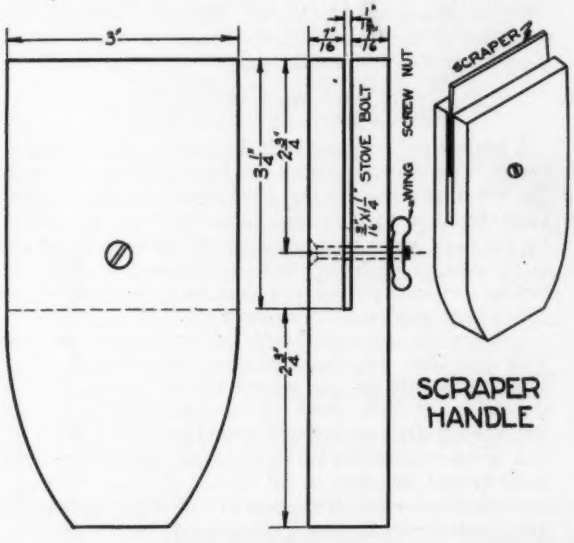
One of the best teaching points in the New-Way Top is that the student is caused to see his project from the craftsman's viewpoint. He selects his lumber with great care. The grain effects must look natural and add to the appearance of the chest, and as the top is viewed more times and more closely than any other part, the student's selection of grain effects is certainly of great importance. With the added opportunity to perfectly match grain effects, the proper selection of stock is of paramount importance. Each board or set of boards will have its own peculiarities and must be arranged accordingly. The edge boards are of especial importance in giving a fine appearance to the finished product. Beautiful matched effects here are the natural result of careful selection of stock.

Dimensions are not shown in this sketch because of the considerable variations required for various types of chests. The idea involved is the important thing.

SCRAPER HANDLE

Carl v. Lindeman, Western State Teachers College, Paw Paw, Michigan

A small but valuable piece of shop equipment is a cabinet-scraper handle. The handle may be made of any 1-in. piece of scrap hard wood. A piece 3 by 6 in. is all that is needed. Lay out the piece and shape it as shown in the illustration.



Next, cut the scraper slot with a backsaw. Stain may be applied and two coats of shellac. The wing-nut screw may be purchased at any hardware store.

REDUCING EXPENSES IN THE WOODWORKING SHOP

Leon A. Orr, Junior High School, Bennington, Vermont

To use an old expression, many of our boys in the industrial-arts shop are not "Well Heeled" when it comes to money for purchasing their completed projects. The cost of an article can be kept down by suitable design, but I have discovered another way whereby I have cut the cost of lumber in half and sometimes even lower.

Lumber dealers frequently find themselves in possession of odd lots of short pieces which they will gladly sell to the schools at a very reasonable cost. Then there are many instructors who buy lumber from other than dealers, but how many keep their eyes and ears open for job lots in out-of-the-way places.

Chestnut lumber, for instance, I have often purchased from farmers in lots of from 200 to 400 feet at very reasonable prices. This was cut from trees that had died or were beginning to die and had been stored for use about the farm. The owners were only too willing to sort, and sell the best to me, at a figure looking good to them, but which I knew to be reasonable.

I bought 1,800 feet of good black walnut planks from a farmer who cut three partly dead walnut trees from his front yard. In my bargaining with him he said they should at least be worth as much as bridge planks, and I heartily agreed with him. The result was that I paid $80 per M for that walnut. After paying for the cartage, resawing, and surfacing, I had a quality lumber at a price much below that quoted by any dealer.

In secondhand lumber there is a great chance for saving. I purchased an old pipe organ, the front of which contained over 500 feet of solid walnut. The pipes were made of the best grade of 1-in. pine put together without a nail or screw. They only needed sawing apart. The price was so reasonable it was like a gift.

When my material runs low I put an ad in the local paper of this nature: "Wanted. New or secondhand walnut lumber in any condition. Old walnut furniture in any shape. A reasonable price will be paid. This material is to be used for manual-training purposes."

Such an ad is sure to get some kind of result. Occasionally, good antiques can be picked up and restored.

Getting secondhand lumber into usable shape looks like an insurmountable problem to some people. It is, however, quite easy. Boys are very willing to wreck secondhand things and to search for and pull out the nails. I have a mahogany square piano in that process now.

The salvaged lumber is stored until a planer or jointer becomes dull and the blades need grinding. Before regrinding, I run my boards through until the blades absolutely refuse to cut any more. The sides of the boards not varnished or painted, are put through first. Of course, some nails will be cut off and the blades greatly nicked. This means more grinding and new blades at an early date, but the saving in lumber would buy many blades with money to spare.

I have kept my boys supplied with walnut lumber for many terms now by pursuing the course outlined in the foregoing and the quest has ever been a source of pleasure and profit.

ATTORNEY GENERAL RULES ON VOCATIONAL-SCHOOL QUESTIONS

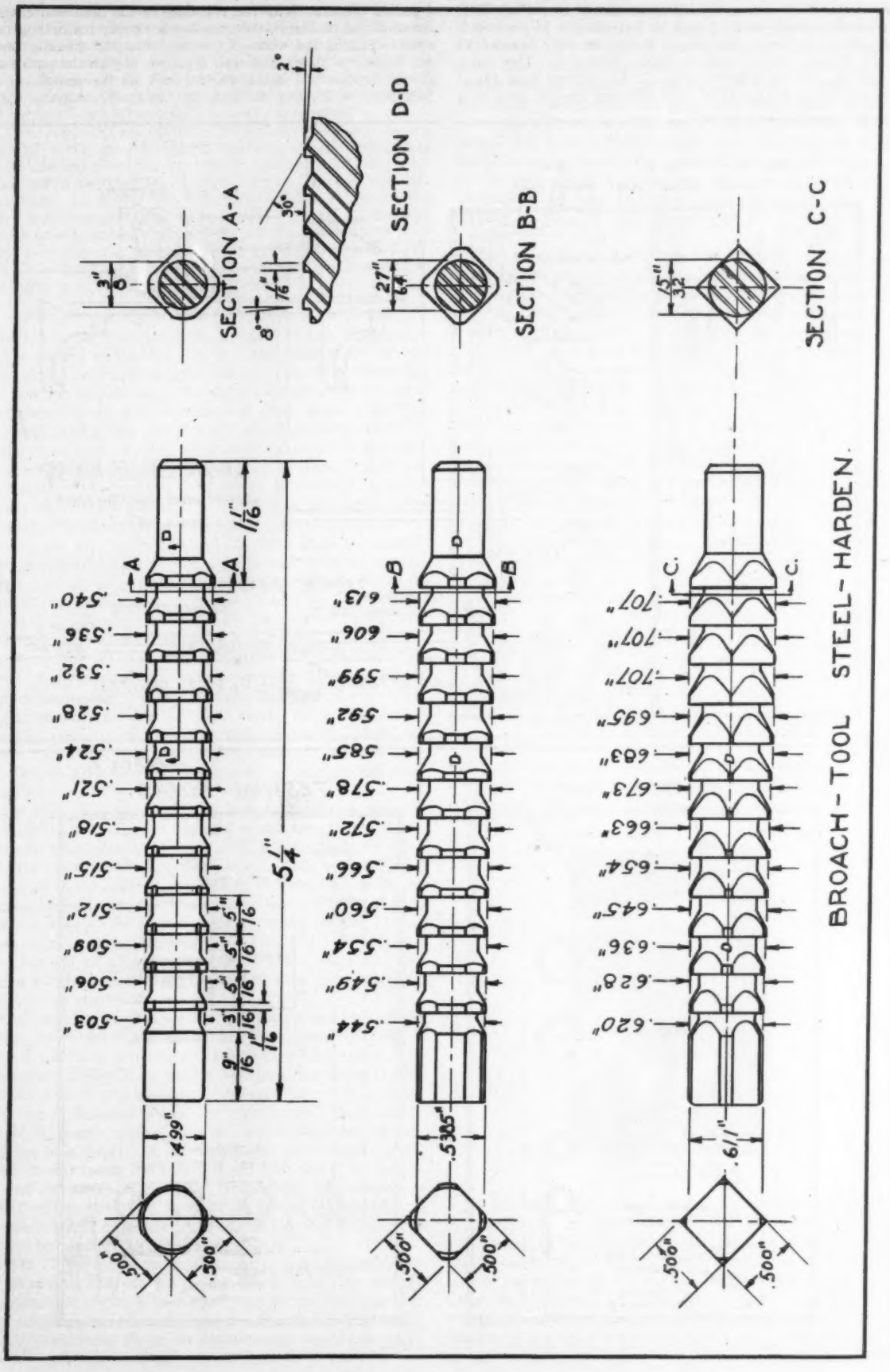
The attorney general of Wisconsin recently gave a number of rulings on vocational problems presented to him for solution. His decisions are as follows:

1. Vocational boards have the right to employ a teacher who has served three years, for an indefinite period.
2. Local vocational schools may delegate power to a director to hire evening and substitute teachers.
3. Members of a vocational-school board hold until their successors are appointed.
4. Interest earned by vocational funds should be credited to the vocational-school fund.
5. Vocational-school boards must carry insurance on vocational-school buildings.

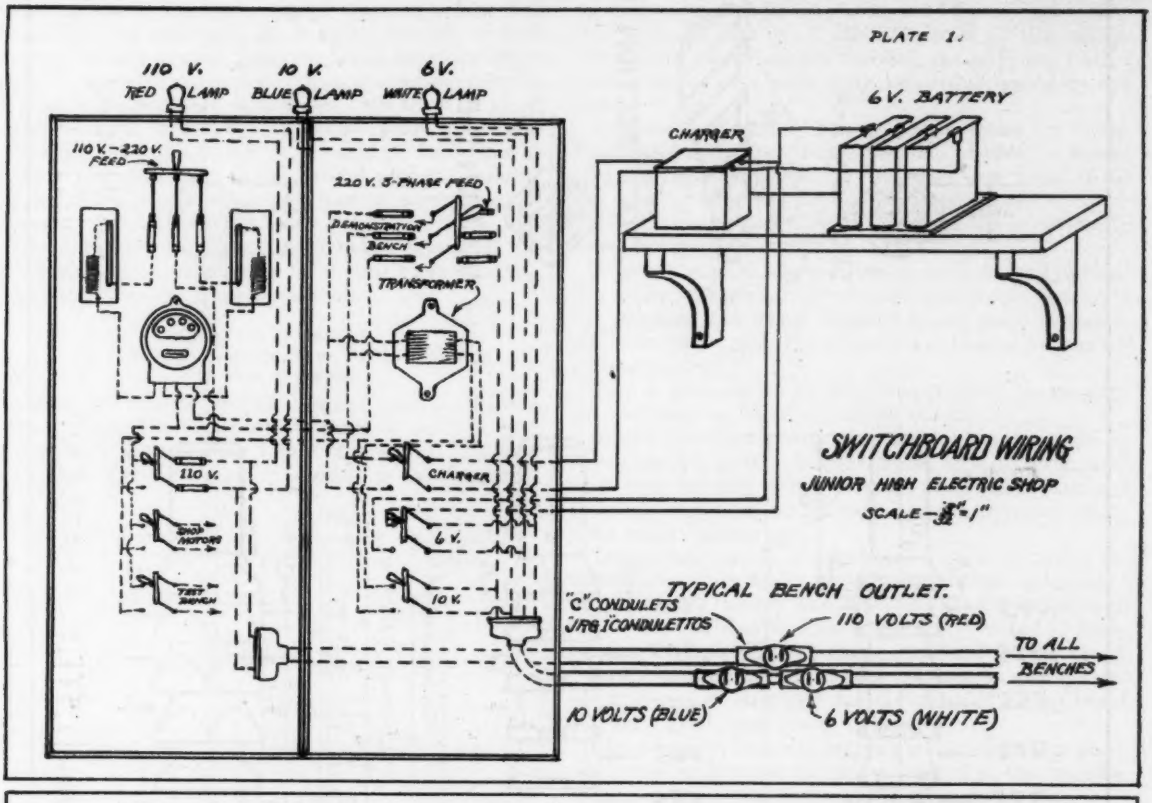
BROACHES

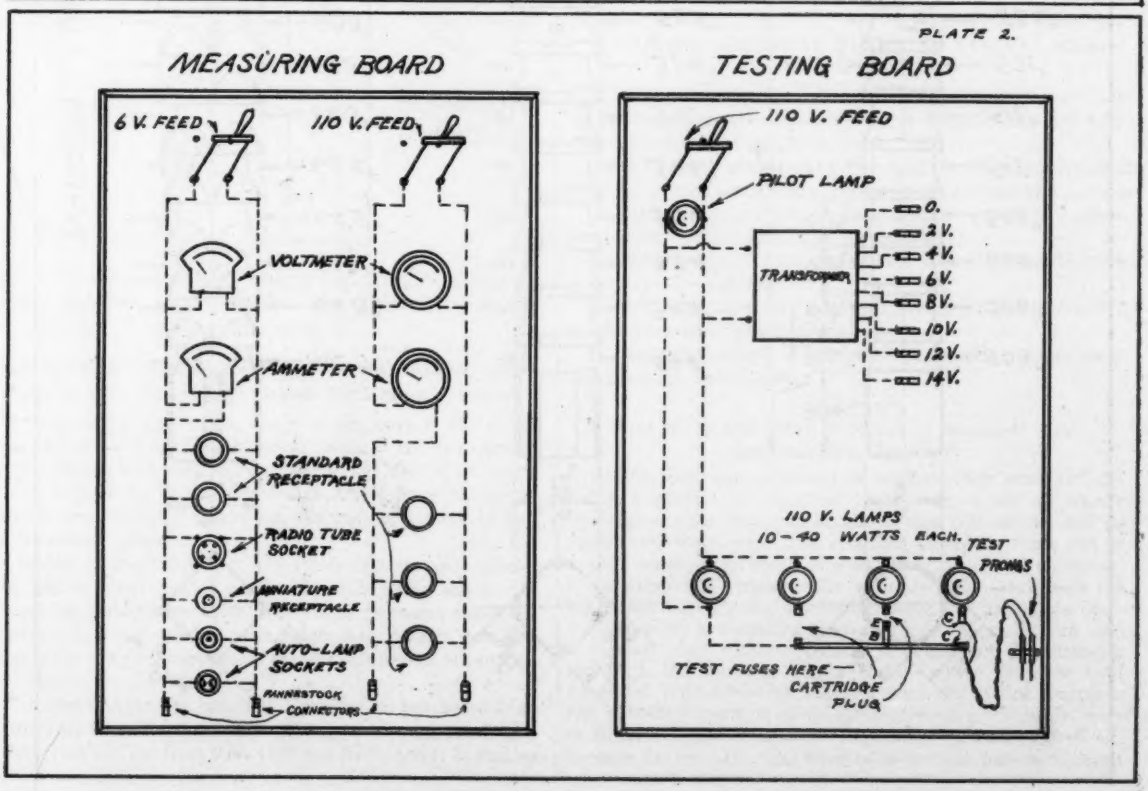
Paul A. Brazier, Morrill School of Mechanic Arts, Concord, New Hampshire

For the boy well advanced in machine-shop work and desiring a project of practical toolmaking, a set of square broaches, as per drawings accompanying this article, will be found very instructive. The broaches should be made out of a good grade of carbon tool steel. The completion of the set of broaches will require quite accurate lathe work with the use of micrometers and machinists' scale for turning the various diameters and spacing them correctly. As each tooth cuts a circular chip which decreases in length as the diameter increases, the diameter of the steps vary to keep the load equalized. With the various steps turned, the 30-deg. clearance can next be turned down to the diameters given in Sections A, B, and C. A form tool can be made and used to good advantage for this step. The front of each tooth may be relieved


SECTION A-A
SECTION D-D
SECTION B-B
SECTION C-C
BROACH - TOOL STEEL - HARDEN.
5 1/4"
1 1/16"
.540"
.536"
.532"
.528"
.524"
.521"
.518"
.515"
.512"
.509"
.506"
.503"
.613"
.606"
.599"
.592"
.585"
.578"
.572"
.566"
.560"
.554"
.549"
.544"
.707"
.707"
.707"
.695"
.683"
.673"
.663"
.654"
.645"
.636"
.628"
.620"
.499"
.5385"
.611"
.500"

with from 5- to 8-deg. clearance, as shown in section DD, for easier cutting, or they may be left straight as preferred. All corners in these chip spaces should be well rounded to avoid danger from cracking when hardening. The lands should be relieved slightly, about 2 deg. having been found sufficient. (See section DD.) This relieving may be done with a pocket oilstone. With the rounding of the pilot and chamfering of the push end, the broaches are ready for milling the square. Placing the work on centers, using the dividing head and footstock center, and with a narrow dog on the push end of the broach and using an end mill in the spindle of a horizontal or vertical machine, the set-up is complete. Cuts





may be made by either the teeth on the periphery or the end teeth, whichever clears the dog most satisfactorily. The push end of the broaches could be made longer and a spiral cutter used on an arbor to mill the square if desired. Cutting oil should be used on the cutter and the work accurately indexed after each cut. After cleaning off all burrs the broaches should be hardened and tempered to a light straw color.

To try out the set made in the writer's class, and having only an arbor press to do the pushing, a lead casting was made and machined ¾ by 2 by 5 in. Four 33/64 in. holes were drilled and then broached as follows: The first hole left as drilled; the second hole broached with No. 1 broach; the third hole broached with broaches Nos. 1 and 2; and the fourth hole broached with all three, thus showing clearly each step. Kerosene as a lubricant helped in making a smooth cut. With a hydraulic press, a piece of steel could be broached in the same manner as the lead casting.

WIRING LAYOUT FOR THE ELECTRIC SHOP

H. J. Johnson, East Junior High School, Duluth, Minnesota

The general wiring layout of the junior-high-school electric shop should be simple and convenient to use. This means that the various circuits must be easily controlled from a general switchboard, and that suitable pilot lamps should be arranged so that they may be easily seen from all parts of the shop. Since each student is generally required to do some measuring and testing jobs individually at some time during the course, provision must be made for these also. This necessitates instruments available to the student, and immediately presents a problem, because ammeters and voltmeters are expensive and very easily damaged. In many shops the number of instruments is very limited, and the instructor often overcomes this difficulty by mounting the instruments which he has on the main switchboard and connecting them permanently into the shop circuits. This arrangement is of little value for instructional purposes, however, because the student is unable to use them on his own job, and to merely "read" a meter that is already part of an existing circuit is neither interesting nor educational. In other words, these meters are not available for useful testing. After some experimenting and making wiring layouts for several shops, the writer has found the general plan outlined herewith very satisfactory. Of course the details may be varied to suit local conditions.

The main or general switchboard is laid out and wired as in Plate I. The only meter mounted on this board is the standard registering kilowatt-hour meter. This is permanently wired into the main feeders and thus meters all the power that is consumed in the shop. It corresponds to the meter which the student probably has in his own home. The installing of such meter is done by the service company rather than the inside wireman in most localities, and so the student need not have a wiring job on this type of meter. The construction and wiring may be explained and demonstrated or the meter cover removed for observation.

Each bench at which a student works is provided with three outlets, as shown in the lower right-hand corner of Plate I. Type-C condulets provided with type-JRG condulettos make a satisfactory outlet. The center of each porcelain fitting is then painted a distinguishing color, corresponding to the colored pilot lamps installed above the switchboard. Each switch should be plainly marked, so that both student and teacher may see at a glance whether a given circuit is closed or not. Short circuits on the 110-volt line will open one of the breakers and extinguish the red lamp, while shorts or overloads on the 10-volt or the 6-volt line will dim or put out the blue or the white lamp, respectively. All circuits in the shop may be cut out by opening the 3-pole main switch.

Plate II shows the arrangement of two other panels, one for measuring and one for testing. These should be entirely separate from the main board, and need not be close together. Any suitable panel about 20 by 30 in. may be used. In order to fully understand the *power equation* and *Ohm's law*, every student should make some calculations involving the use of ammeter and voltmeter. This simple measuring board enables the student to test any of the ordinary devices commonly used. Low-voltage lamps, auto lights, radio tubes, etc., are simply plugged into the proper socket. Bells, buzzers, coils, and similar devices not provided with bases are connected across the Fahnestock connectors at the bottom of the board. Lamps and other 110-volt devices are tested on the right-hand side of the board. Two ammeters and two voltmeters are all the instruments required, and there is little chance of breakage or of burn outs. The instructor may require the student to have his job approved before throwing in the switch.

The testing board is so simple and easy to construct that a study of the diagram is all that is needed to make it clear. It is a great convenience and time-saver in the shop, and, in fact, is a worth-while addition to the home workshop of a radio or electrical "fan." A few cleat receptacles and a double-pole switch mounted on a suitable board really comprise the testing board. A transformer with various voltage taps is a convenience but may be dispensed with. Brass strips B are fastened to the board as shown, and about ½ in. of the strip should be turned up at E to make a contact for testing plug fuses. Fahnestock connectors are used at point C. The test prongs may be made by driving an 8d finishing nail into a wooden handle, grinding to a point, and soldering one to each terminal of a flexible lamp cord. These prongs are useful in exploring a motor, appliance, or similar device for shorts, open circuits, grounds, etc. The lamps used may be of any convenient size small carbon lamps, these being very rugged and serviceable.

NOTED TEACHER TRAINER DIES

The death of Robert H. Rodgers is the second great loss which the Milwaukee Vocational School has sustained within a year. His demise, however, represents a loss not only to one school or to one city or to one state, but rather to the entire United States.

ROBERT H. RODGERS

He was born in Portland, Oregon, where he served an apprenticeship in the patternmaker's trade. After working as a journeyman at this trade for several years, he entered Oregon State College where he received the degree of bachelor of science in mechanical engineering. Subsequently, he went to Columbia University and received a degree of bachelor of science in industrial education. Then for two years he took postgraduate work at Columbia, during which time he taught

in the St. George's Evening Trade School and did settlement work on the east side of New York.

In 1914 he went to the Stout Institute at Menomonie, Wisconsin, as an assistant in the department of industrial education, and later became head of this department. In 1919 he returned to New York as the assistant in charge of industrial education in the State Department of Education at Albany, which position he held until he came to the Milwaukee Vocational School in 1923 to assume the position of director of the teacher training and research department. It was the work done at this institution which made him known nationally.

As educator, lecturer, and educational writer, Mr. Rodgers may be ranked among the best in the United States and his death is a loss which will be mourned by everyone who was even slightly acquainted with him.

MR. FALK AWARDED MASTER OF SCIENCE DEGREE

An honorary degree of master of science was conferred upon Harold S. Falk, vice-president and works' manager of the Falk Corporation, Milwaukee, by Marquette University, at the commencement exercises on June 11. The degree was given in recognition of the work done by him in the promotion of apprentice training in American industries.

HAROLD S. FALK

Mr. Falk has played a leading part in the revival of apprentice training during the past ten years. In addition to building up an effective apprentice-training system in his own plant, Mr. Falk has for ten years acted as chairman of the apprenticeship committee of the National Metal Trades Association in Milwaukee. He has at all times emphasized the responsibility of manufacturers for the development of adequately trained mechanics and technicians in their industry, and has therefore done all in his power to foster the idea that the training of a proper quota of mechanics for an industrial community is not the duty of one manufacturer, but rather the joint responsibility of all the manufacturing industries in that community. Under his leadership the number of apprentices in the metal trades industries of Milwaukee has grown from about 40 in 1920 to 1,100 at the present time.

¶ Mr. Denman Kelly, of the Dallas Technical High School, Dallas, Tex., died at New Bethel, Ind., on June 15. Mr. Kelly was for three years state teacher trainer at Terre Haute, and was for three years a member of the state education department in the capacity of state supervisor of industrial education. He was a graduate of Swarthmore College and held a master's degree from Indiana University.

¶ Mr. Edwin J. Ogden, instructor in industrial arts in the high school at Latrobe, Pa., passed away on Saturday, July 5, after a serious injury. His death was due to an accident in the shop of an industrial plant at Midland, in which he was working during his vacation period. Mr. Ogden was a teacher of unusual ability and was in high esteem by his students and coworkers.

¶ John A. Chamberlain, supervisor of manual training for the public schools of Washington, D. C., died recently at his home in that city. Mr. Chamberlain, who was born in Massachusetts, was a graduate of the Worcester Polytechnic Institute, and held the degree of mechanical engineer. He came to Washington in 1887 to accept a position as instructor in manual training in the Washington High School. In 1906 he was made supervisor of manual training for the district, a position which he had held up to the time of his death.

¶ Mr. M. C. Small has been appointed head of the new department of vocational agriculture in the high school at Sullivan, Ind.

¶ Mr. L. L. Rummell, of Columbus, Ohio, has been elected president of the Ohio Vocational Association.

¶ Mr. Russell R. Clark has been appointed supervisor of industrial rehabilitation work for the State of Illinois.

¶ Mr. Robert W. Roberts, formerly teacher of shopwork in the Lincoln Junior High School, Medford, Mass., has been appointed as a member of the vocational faculty in the Medford High School.

¶ Mr. C. A. Cain has been appointed manual training teacher at Dennison, Ohio.

¶ Mr. Clarence H. Cole, of Walkerville, Can., has been appointed as instructor in architectural drawing at the Windsor Technical School.

¶ Mr. M. P. Winters, formerly of Storm Lake, Iowa, has accepted a position as head of the manual-arts department of the Glenbard Township High School, Glen Ellyn, Illinois.

¶ Mr. D. A. Moser, of St. Louis, Missouri, has been assigned itinerant instructor to teach a course in barbering in the vocational school at Appleton, Fond du Lac, Neenah, Menasha, and Sheboygan, Wisconsin. The course is covered in eighteen weeks.

¶ Mr. Harold Falk, vice-president and works' manager of the Falk Corporation, Milwaukee, was elected a member of the vocational school board at Milwaukee, Wisconsin.

¶ Mr. Isabelo Sarmiento, formerly with the Cebu Trade School in the Philippines, has recently become principal of the Ilocos Sur Trade School at Vigan, Ilocos Sur, P. I.

¶ Mr. Lester Ramsey has been elected instructor in manual training at Sandpoint, Idaho, to succeed H. E. Miguel.

¶ Miss Margaret A. Jones has been nominated for the position of principal of the Brooklyn Industrial High School for Girls, to be opened in September. Miss Jones has had eight years of experience in the dressmaking trade and five years of experience in industrial high-school work, with additional experience in the evening technical and high schools of Newark, N. J. She holds a state certificate for director of vocational education.

¶ Mr. Fred W. Boland has been appointed director of trade training at Pittsburgh, Pa., for a twelve-month school term.

¶ Mr. W. R. Roberts, formerly vocational instructor at Springfield, Ohio, has been appointed to a similar position in the Harding High School at Marion.

¶ Mr. Andrew E. Charles, of Pittsburgh, Pa., has been appointed an instructor in the industrial department of the high school, Lock Haven, to succeed G. P. Lanks, who has gone to McKeesport. Mr. M. A. MacDonald, of McKeesport, will succeed Mr. F. S. Knecht, as an instructor at Lock Haven.

¶ Mr. J. R. Behr, of Dayton, has been appointed head of the vocational department in the high school, Center Grove, Ind.

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Stanley-Atha Cold Chisels No. 99 are made of electric furnace chrome vanadium alloy steel. Drop forged, oil hardened and tempered to insure a tough cutting edge. Flat pattern assures a firm hand.

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NOW, ARE THERE ANY QUESTIONS?

A FINISH THAT PITTED

925. Q.: I am having some trouble in the finishing of a walnut-veneer table top. The trouble is just this, after every rubdown with 3/0 sandpaper and oil, the oil being washed off with a cheesecloth pad saturated in denatured alcohol. As soon as the varnish or shellac coat is applied and begins to dry, small round pits or pock marks will appear.

This is the method of proceeding with the finish. The walnut being sandpapered smooth after being raised with water and dried for 24 hours, it was stained with a walnut stain made from B. asphaltum and gasoline. After this stain was thoroughly dry, a wash coat of white shellac thinned about ½ with denatured alcohol was applied. After drying well it was rubbed with 3/0 sandpaper and oil, a second coat of white shellac was given without thinning down and rubbed in the same way as the first coat.

The third coat was a good clear varnish. Here the trouble showed up. This entire coat of varnish was full of pits about ⅛ in. in diameter. We removed everything and restained thinking that possibly the boy was not very careful in removing the oil with the pad saturated with alcohol. Again the spotted condition returned, and it will not work out any way I try to work it. — *U. L. H.*

A.: The entire trouble in producing your finish on the walnut is caused by the use of oil in your sanding work. In the first place, oil should never be used on undercoat sandings. In the second place it is of no avail to try and get it off again with alcohol, for the reason that the wood around each pore is saturated. When a coat of shellac is applied it cannot cling to the wood around the greasy pore and hence withdraws upon itself to form a ring, or pit.

To get started right again, clean off all the job with a good varnish remover, then follow with rags saturated in denatured alcohol, to break up any traces of paraffin remaining from the remover. Sand clean to bright wood. Apply a water stain rather than the one made of asphaltum, which, unless of a particular type, is a mean trouble maker. Without sanding apply a coat of orange shellac diluted with 4 parts of denatured alcohol. The orange shellac should be used rather than the white, since the latter will leave a gray cast beneath the varnish. Sand the dried shellac coat with a split 6/0 paper. Dust off and fill with a silex filler, chocolate brown in color, carrying about 12 lb. of filler per gallon of thinner which should be made of 1 part of pure turpentine and 2 parts of gasoline. Clean off thoroughly and dry 48 hours. If the time is short make up a solution of 1 qt. standard denatured alcohol and stir slowly into ½ gal. of shellac mixing lacquer. This will give a splendid material which can be brushed easily with a soft-bristle brush — a Fitch, for instance. Sand clean with a split 6/0 paper. This finish is quite waterproof and wear resistant.

If sufficient time still can be had for a varnish finish, use a high-grade four-hour varnish, sand between coats, and rub the last with FFF pumice stone, crude oil, and felt pad. Clean up with a good polish. — *Ralph G. Waring.*

COLONIAL MAHOGANY AND WALNUT FINISH

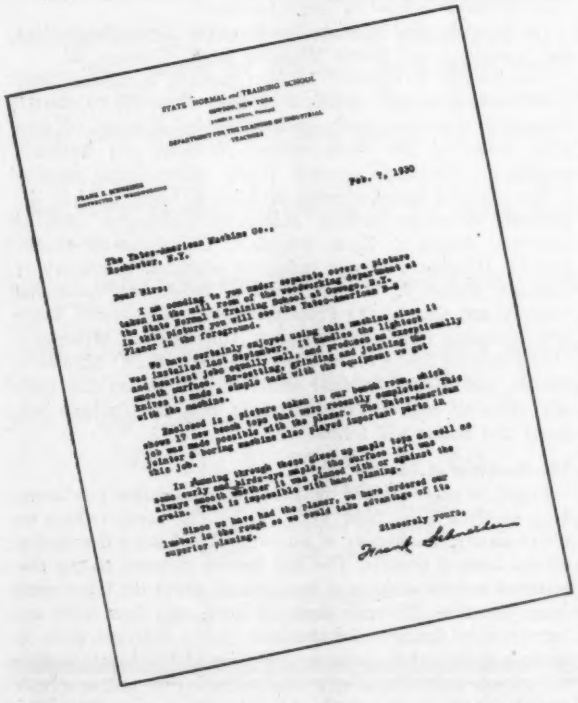
926: Q.: Can you give me any information of finishing mahogany or walnut furniture as it was done in Colonial times? I do not want a highly polished varnish surface, but a soft finish. — *R. N.*

A.: In Colonial times the only stain materials available were lime, linseed oil, vinegar with iron. The first reacted on the walnut and mahoganies to produce deep browns and fiery

(Continued on Page 28a)

a satisfied customer

— is our best advertisement



STATE NORMAL and TRAINING SCHOOL
GENESEO, NEW YORK
DEPARTMENT FOR THE PREPARATION OF INDUSTRIAL TEACHERS

FRANK E. SCHNEIDER
Instructor in Woodworking

Feb. 7, 1930

The Yates-American Machine Co.,
Rochester, N.Y.

Dear Sirs:

I am sending to you under separate cover a picture taken in the mill room of the woodworking department at the State Normal & Training School at Geneseo, N.Y. In this picture you will see the Yates-American 8-0 Planer in the foreground.

We have certainly enjoyed using this machine since it was installed last September. It handles the lightest and heaviest jobs equally well, and produces an exceptionally smooth surface. Re-setting, grinding and jointing the knives is made a simple task with the equipment we got with the machine.

Enclosed is a picture taken in our bench room, which shows 17 new bench tops that were recently completed. The job was made possible with the planer. The Yates-American jointer & boring machine also played important parts in this job.

In running through these glued up maple tops as well as some curly and birds-eye maple, the surface left was always smooth whether it was planed with or against the grain. That is impossible with hand planing.

Since we have had the planer, we have ordered our lumber in the rough so we could take advantage of its superior planing.

Sincerely yours,
Frank Schneider

Frank E. Schneider, instructor in woodworking at State Normal and Training School, echoes the sentiment of users of Yates-American machines the world over when he says, "We have certainly enjoyed using this machine since it was installed."

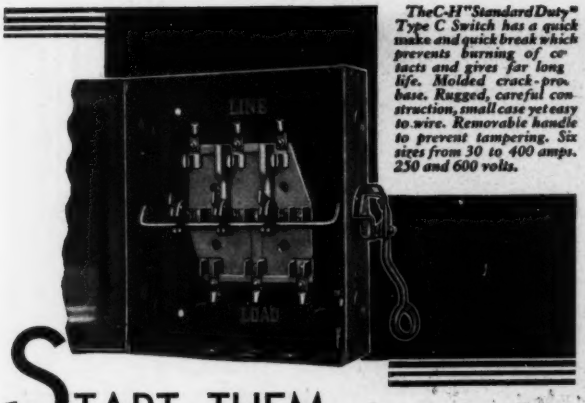
With the idea in mind that a satisfied customer is our best advertisement, we endeavor to make every customer a satisfied one. Infinite care is taken in the construction of Yates-American machines and this care is returned a hundred-fold in customer good will and satisfaction.

Write for Information.

Vocational Division

YATES - AMERICAN MACHINE COMPANY

BELOIT, WISCONSIN



The C-H "Standard Duty" Type C Switch has a quick make and quick break which prevents burning of contacts and gives far long life. Molded crack-proof base. Rugged, careful construction, small case yet easy to wire. Removable handle to prevent tampering. Six sizes from 30 to 400 amps. 250 and 600 volts.

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THE materials they will use in after years are the materials with which your students should practice. Because many of the leading contractors the country over use Cutler-Hammer Wiring Devices and Safety Switches, familiarity with the C-H Line is an important part of your students' training.

But giving their students a short cut to practical knowledge of the field is not the only reason why instructors are using C-H Products in the classroom. C-H Products make the teaching of sound engineering principles easier. They incorporate the results of over 30 years' experience of some of the foremost electrical designers in the country . . . are thought-inspiring examples of what such products should be in performance, construction and design from the standpoint of installation.

To help you in your teaching work and in ordering equipment for use in the classroom, we will gladly send a copy of each of the C-H Booklets, *"Modern Wiring Necessities"* and *"Safety Switches."*

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(A-402)

(Continued from Page 26a)

reds. The linseed oil gave a semblance of depth to both woods without producing any finish. Vinegar which had been allowed to react on nails or other wrought iron gave a solution which produced black or very dark brown on woods, possessing tanin. To produce a color on mahogany similar in tone to colonial types, use 1 oz. of standard mahogany red and 3 oz. of mahogany brown per gallon of hot water. Let stand overnight to be sure all materials are in solution. For the walnut use 3 oz. of standard brown walnut per gallon of hot water

Apply the stain to the previously sponged, dried and resanded wood, and let dry overnight. Without sanding, apply a coat of shellac and lacquer solution made up of 1 qt. of standard orange shellac, 1 pt. of white shellac, reduce with 1 qt. denatured alcohol and stir slowly *into* ½ gal. of shellac mixing lacquer. This will give a splendid material which can be brushed easily with a soft-bristle brush, such as a Fitch. Sand clean with a split 6/0 paper. This finish is quite waterproof and wear resistant.

The requisite number of coats should be given, sanding with a split 6/0 paper between coats, and rubbing the last with FFF pumice stone, felt pad, crude oil, and lastly with cotton flannel wet with water and smeared with some of the waste rubbing oil and pumice.

For best effects, it is advisable to use a filler coat over the first coat of sanded shellac. The filler should carry about 12 lb. of paste per gallon of thinner. — *Ralph G. Waring.*

Your Children — What of Their Careers?

Published by the Institute for Research in the Professions and Vocations, 624 South Michigan Blvd., Chicago, Ill.

The booklet is intended to help parents in guiding their children to a proper selection of their lifework. "Careers" represents a serious work, undertaken by a group of men after years of the most careful planning and intensive research.

The editorial board consists of John A. Lapp, head of department of social sciences, Marquette University, editorial director; George F. Zook, president, University of Akron; Paul H. Douglas, professor industrial relations, University of Chicago; Robert L. Cooley, director, Milwaukee Vocational School; and Charles A. Prosser, director, Dunwoody Institute, professor vocational education, University of Minnesota.

Circulars on dentistry, medicine, commercial art, diplomatic service, advertising, consular and foreign trade service, geology, chemical engineering, and music have already been prepared and others will follow.

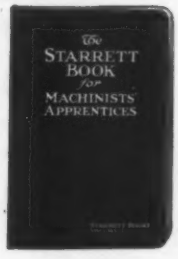
The Romance of Leather

Paper, 24 pages. Issued by the American Leather Producers, Inc., 41 Park Row, New York, N. Y. The booklet takes on the character of a history of leather and includes a description of the tanning process. The last section devoted to the raw material and the making of leather tells where the hides come from, describes different kinds of hides, tells how hides are converted to leather, and the uses of the different skins in making leathers for commerce. The booklet is being used in the schools and colleges as a standard reference and as a basis for classwork in the study of industries. commercial geography, and economics.

Mechanical-Drawing Tests

By Ferdinand A. P. Fischer. One test each, Parts I and II, Manual for Teachers, Class Record, Marking Keys, price, 75

(Continued on Page 30a)



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The "Yankee" brace is unlike any other brace. Its position in tooldom is like that of a fine car in the auto industry. Its appeal is to those who take pride in ownership of finer things . . . appreciate precision and finish in toolmaking . . . understand the long-run economy of paying a little more for quality and efficiency.

It is being bought on sight by men who thought they did not need another bit brace. And by men making sure they will never have to buy another.

"Yankee" Chuck will not loosen. Patented quick centering. Ball bearing. Any bit, round, square, any taper, held accurately. Two-jaw. Holds ⅛" round; ⅝" square (across corners).

No. 2100. Four sizes: 8-, 10-, 12- and 14-inch. Price, with 10-inch sweep, $8.20.

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You may send "Yankee" Tool Book (offered in Industrial Arts) —Showing Spiral and Ratchet Screw-drivers, Automatic Push Drills, Ratchet Braces, Socket Bit-Extensions, Ratchet and Plain Breast and Hand Drills, Automatic Chain and Bench Drills, Ratchet Tap Wrenches, Continuous-Work Swivel Vises, Plain Screw-drivers, Etc.

(Please clip and write name and address in margin below)

(Continued from Page 28a)

cents. Published by The Bruce Publishing Company, Milwaukee, Wisconsin.

This mechanical-drawing test consists of two parts. Part I is composed of tests 1, 2, 3, and 4 and is a technical information test. Part II is a performance test and consists of tests 1, 2, and 3.

The manual for teachers which accompanies the set, gives explicit directions for the administering of the tests.

Stencilling

By F. R. Smith. Boards, 126 pages. Price, $1. Isaac Pitman and Sons, New York City.

A knowledge of stencilling and reasonable skill in this art are of value to every craft worker and to workers in any of the trades. The present book provides a complete statement of the basic methods of working, of the designing of stencils, of adapting various types of design to the limitations of stencilling. It suggests typical applications to mural work, fabrics, furniture, sign painting, etc. The book is fully illustrated and has excellent adaptation to school uses.

Handcraft

Paper, 12 by 14 in., 79 pages. Compiled and published by the Playground and Recreation Association of America, New York City.

This is a revised and greatly enlarged edition useful as a summer playground teacher's manual in toymaking. The compilers have frankly recognized the fact that complicated toys and articles which require fine workmanship, expensive materials, and a fine finish, are clearly beyond both teachers and children who frequent the summer playgrounds. The toys range from the very simplest combinations of paper and cardboard, such as can be made by little tots of 6 or 7, to some rather interesting kiddy cars and toy wagons such as older boys can put together. The interests of girls have not been forgotten but are provided for in the shape of simple problems in needlework, such as rag dools, lamp shades, school bags, and other simple trinkets. A carefully selected list of references is included in the volume. The fact that all the problems are full size, with few exceptions, makes the book especially attractive.

General Mechanical Drawing

By R. A. McGee and W. W. Sturtevant. Cloth, 192 pages, 6 by 9, illustrated. Price, $1.48. Published by the Bruce Publishing Company, Milwaukee, Wis.

This mechanical-drawing course for junior high schools consists of 51 lessons. Technical, related, and occupational information are a part of each lesson. This insures that the student obtains more than mere skill in making drawings. The lesson material has been collected from many sources so that it is quite general. Individual differences are recognized in the different problems by arranging the material on different ability levels. Testing levels and materials also are included.

While this material is specially designed for the junior high school, it is equally applicable to part-time vocational-school drafting classes.

The lesson material will be found to have an interest appeal to all boys of the 13 to 16 year age levels.

Planning Your Future

By George E. Myers, Gladys M. Little, and Sarah A. Robinson. Cloth, 417 pages, 5½ by 8, illustrated. Price, $1.50. Published by McGraw-Hill Book Company, Inc., New York.

This book is divided into four parts. Part I takes the high-school pupil into the world of occupation. There are 18 units to this part. Part II consists of five units and takes up the occupations in the pupil's own community. Part III, consisting of seven units, makes a study of the facts every worker should know, and Part IV takes up the question of how the student is to find his own place.

The book is well illustrated, contains many valuable tables, and a good bibliography.

MAY MEETING OF THE BOSTON VOCATIONAL SOCIETY

The annual meeting of the Boston Vocational Society was held on Saturday, May 24, at the Peleg Francis Farm in Rehoboth, Mass. At this meeting the society was the guest of the Rhode Island Vocational Society.

After a luncheon, the society held a business session, at which the annual election of officers took place. The following were elected:

President, Mr. James Gearon, Everett; vice-president, Mr. Willis Brown, Boston; secretary, Mr. Leslie Nutting, Beverly; treasurer, Mr. Louis Van Ham, Boston; librarian, Mr. Forrest Mason, Quincy. Mr. Nutting was named to take the place made vacant by the death of Mr. Harold Wise.

Following a clam bake, short talks were given by the presidents of both societies, by Mr. Raymond Perry, formerly of Boston but now in the employ of the Rhode Island State Department, and by Dr. Carroll of Rhode Island. — *Louis A. Van Ham.*

TEXAS TRADE AND INDUSTRIAL TEACHERS' CONFERENCE

The Texas Vocational Teachers' Conference was held at the Agricultural and Mechanical College of Texas, at College Station, Texas, during the week of June 16, with approximately sixty teachers and of supervisors of trade and industrial subjects in attendance.

The conference was made possible through the combined efforts of Mr. N. S. Hundson, director of trade and industrial work for the state of Texas, and Prof. E. L. Williams of the department of industrial education at A & M College. The meeting was so successful and the demands on the part of the teachers so insistent that it is likely to become an annual institution.

At the beginning of the week the group was divided into working committees, composed of a group of machine-shop teachers and teachers of related subjects, under the charge of Mr. C. E. Rakestraw, agent for the Federal Board of Vocational Education. Another group, composed of shop and related-subjects teachers in the woodworking departments, under the charge of Prof. Williams; the printing teachers, both shop and related, under the leadership of Prof. Fox; a women's group under the charge of Mr. Hundson and Prof. Laura Murray of the University of Texas; and a group of auto mechanics, welders, and plumbers, led by Ray F. Kuns, principal of the Automotive Trades School, Cincinnati, Ohio.

The interest in the group meetings was intense and the work of the several committees was recorded on large sheets of paper, which were sent to the office of Professor Williams, to be included in the permanent records.

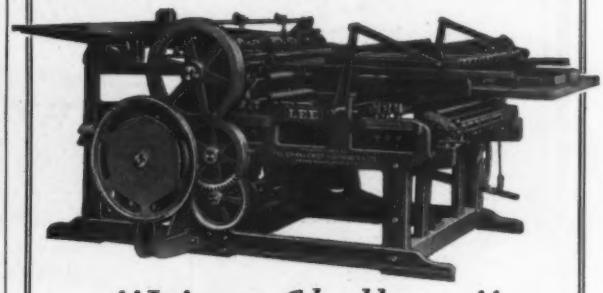
Four and one-half hours were spent each day in group conferences and one and one-half hours each morning, in general assembly. The work of the general assembly covered items of general interest to all trade and industrial teachers in Texas.

Mr. Rakestraw, who led the morning discussions, covered methods of analyzing trade and industrial-education needs of Texas and methods of securing close coöperation between industrial leaders and the schools.

Mr. Kuns, in his work with the morning group, covered the Cincinnati plans for vocational education, which is coming to be spoken of as occupationally segregated schools and the Cincinnati coöp plan. In a final meeting, he spoke on publicity methods.

(Continued on Page 34a)

SAFE *The* **LEE PRESS** *is ideal for* **student and apprentice work**



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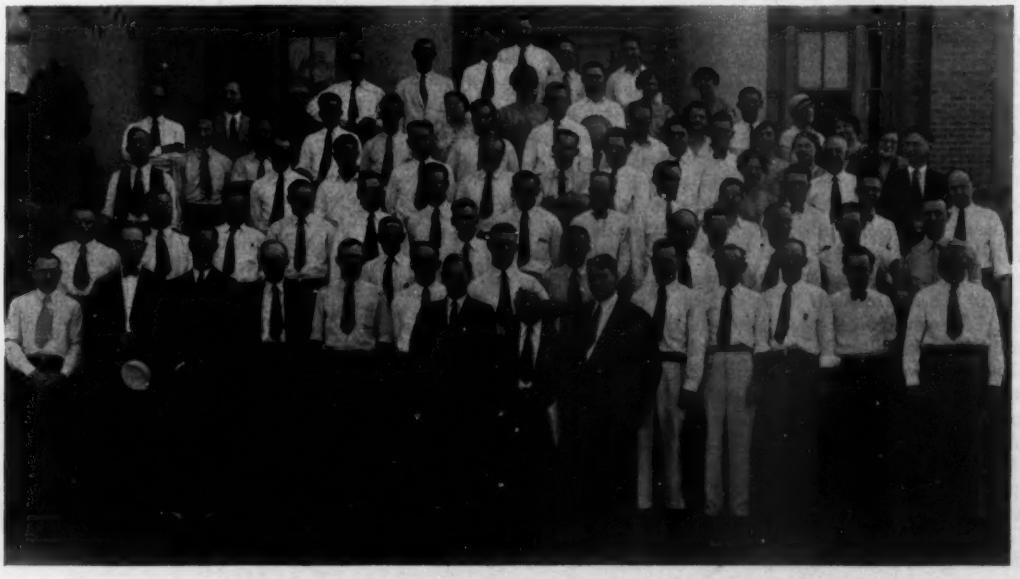
(Continued from Page 33a)

Under the charge of Mr. Hundson, who is the oldest manual-training teacher in the State of Texas, in point of service, the trade and industrial viewpoint of Texas has gone ahead rapidly. With Professor Williams on the job at A & M and the close coöperation between these two and all of the supervisors of trade and industrial schools, as well as the wonderful spirit of coöperation of the classroom teachers, Texas may well be said to be on its toes in a trade and industrial way.

This large state is coming into a proper realization of the tremendous resources within its wide-flung borders. While oil has done much to win a place alongside of cotton, there are many movements afoot looking toward the industrialization of the many resources within the state. It is not amiss to say that within another decade Texas will loom much larger in the industries of the nation. The vocational schoolmen are playing an important part in the movement.



GROUP ATTENDING TEXAS TRADE AND INDUSTRIAL TEACHERS' CONFERENCE

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The complete materials for assembling and weaving this practical footstool cost only $1.35. The frames are cut to length, drilled, and tapered accurately; plenty of Art-Fibre, Multi-Colored Seat Cord for weaving the seat; nails for tacking; silence domes for the legs; glue sizing and directions are included.

Rush-Style seat weaving can be taught in your present classroom without spending any money for special equipment or machinery. The weaving of rush-style seats for Colonial furniture provides fascinating, instructive hand work.

Art-Fibre, Multi-Colored Seat Cord is stronger, easier to weave, makes a better looking finished job, and is cheaper than flag. It comes in continuous lengths in one, two, and five pound coils, and is worked dry just as it is received. For footstools, chairs, and benches it is the most practical seat weaving material known. Complete directions for doing rush-style seat weaving included with every order.

Make the practical footstool pictured here. Learn by first hand experience the advantages of Art-Fibre for seat weaving work. All necessary materials for assembling and weaving this footstool will be sent for $1.35 plus the postage.

The 1931 Book of "Designs and Materials for Art-Fibre Weaving Projects" will be ready about September first. Include ten cents for your copy now.

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Instructor's Table No. L-2062

Art Table No. L-2077

Tool and Board Case No. L-2072

Drawing Table No. L-2028

Drawing Table No. L-2044

School Shop Equipment News

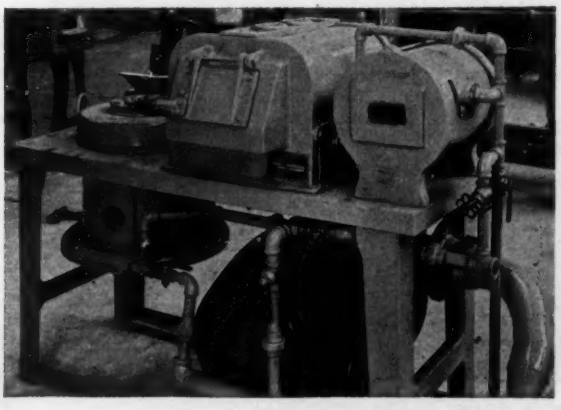
For the Supervisor and Teacher who desires to keep abreast with news of new Machinery, Tools, Supplies, etc.

ANNOUNCE STEWART TRIPLE-PURPOSE FURNACE

The Stewart Triple-Purpose Furnace is the latest addition to the line of Stewart industrial furnaces, manufactured by the Chicago Flexible Shaft Company. It is especially desirable for school shops.

The furnace is equipped with a Spencer turbo compressor, mounted underneath, to make the entire unit complete without any extra piping, except for the gas fuel. The oven is for annealing, carburizing, and hardening of all kinds of steel, and the pot section for use in lead hardening, oil tempering, and cyanide hardening.

The small section may be used either as a forge, or as a tool-dressing furnace, and may be used for heating the ends of pieces. By removing the plug in the back wall, it may be used for bending work. It also is suitable for the dressing of lathe and planer tools, especially those made of high-speed steel.

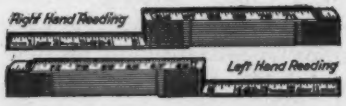


The compressor, which is motor-driven, is a three-stage outfit, capable of delivering air pressure at 1½ pounds pressure, without surging or pulsation.

Complete information and prices may be obtained from the Chicago Flexible Shaft Company upon request.

NEW LUFKIN SPRING-JOINT FOLDING RULE

A spring-joint folding wood rule incorporating some new and valuable features, has been placed on the market by the Lufkin Rule Company, Saginaw, Mich.



The rule which is known as the "two-way, red-end rule" has a number of useful features for carpenters and mechanics. On one side of the rule, figures run from left to right, right hand; on the other side, they run from right to left, left hand. The two-way feature is useful for finding the balance of space completing any measurement, and for measuring from the left- or the right-hand end or wall. The rule is in white-enamel finish, 5/8 in. wide, with 6-in. sections, and in 4-, 5-, and 6-ft. lengths, and has the advantage of saving time and guarding against errors in measurements. Other advantages are the rustproof metal spring joints and trimmings, strike plates for preventing wear, and its high-grade material and finish.

(Continued on Page 39a)

CHECK UP ON YOUR EQUIPMENT NEEDS!

How about your vocational equipment—is it in readiness to stand the gaff for the new year ahead—have you sufficient equipment to accommodate the students?

Whether you need Manual Training Benches, Drawing Tables, Storage Cases, Instructors' Tables, or any other specialized Vocational Furniture — you can get prompt shipment from SHELDON.

Check up today, and you may save much expense a little later. Take advantage of SHELDON'S complete facilities to serve you to your entire satisfaction — speedily.

E. H. SHELDON & COMPANY, Muskegon, Michigan

Specialists in Vocational Training

(Continued from Page 36a)

NEW STANLEY TRACING SHEETS FOR SHOP USE

The Stanley Rule & Level Company, of New Britain, Conn., has issued a series of tracing sheets on woodworking processes for use in making blue prints for the bench or for the boys' notebooks. The sheets, which are miniatures of the former Stanley wall charts, are 8 by 10½ in. in size and may be obtained at the small price of one-half cent each. Each sheet contains illustrations and directions for carrying out each project.

Complete information may be obtained from the Stanley Rule & Level Company, at New Britain, Conn.

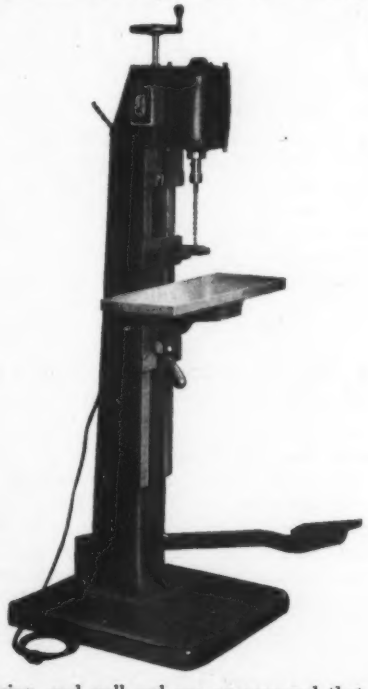
MR. McCORMICK BECOMES ADVERTISING MANAGER OF PEASE COMPANY

Mr. C. D. McCormick, formerly assistant advertising manager of the C. F. Pease Company, Chicago, Ill., has recently become advertising manager of the firm, succeeding Mr. W. Earle Pashley, who has become second vice-president. Mr. McCormick has been a member of the firm for the past four years, and previously was connected with the Illinois Glass Company at Alton.

NEW OLIVER PORTABLE MOTOR-IN-HEAD, SINGLE-SPINDLE BORER

The Oliver Machinery Company, of Grand Rapids, Mich., manufacturers of woodworking machines and machine tools, has announced its No. 194-B portable motor-in-head, vertical, single-spindle borer as an addition to the Oliver line of woodworking machinery.

The No. 194-B boring machine will take care of holes up to ¾ in. in hard wood and 1½ in. in soft wood, 4 in. deep, in the edge of a board 22 in. wide, with table in use, or in a board 36 in. wide, when the table is not used. It is capable of boring to center of pieces 8 in. wide. The machine has a plain-wood-top table, with vertical adjustment, a ½-in. boring bit, a ½-h.p. vertical ball-bearing motor, and can be operated from any light socket. It is rapidly and easily operated and is instantly adjustable to any desired position. The



treadle, spring, and pull rod are so arranged that the maximum fulcrum power is obtained, making the treadle operation so light that any boy can easily operate the machine.

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Stout Institute Holds Summer Session

The Stout Institute summer school, which opened on June 16 for its 25th annual session, had a total enrollment of 511 students, which was the largest enrollment in the history of the school. The enrollment of men, which reached a total of 356, was the largest enrollment of men in either a summer or regular session. While a large proportion of the attendance was from Wisconsin, there was a good representation from 25 different states. Seventy of the students received the bachelor of science degree at the close of the school.

During the summer session, the school enjoyed the benefits of new and improved shop and laboratory space and equipment effected as a result of curriculum revisions and expansions.

Shop Tests for Shop Instructors

Mr. D. H. Zorger, instructor in shopwork at Lancaster, Pa., has prepared another series of shop tests in sheet-metal work, electricity, and woodworking, for use in the seventh and eighth grades. The woodshop test is a recognition test of tools used in woodworking. The test for machine-shop tools, and for the power lathe are similar to the foregoing.

Instructors who write to Mr. Zorger are urged to inclose stamp for return postage.

Begin Occupational Survey in New York City

An occupational survey to determine the amount and type of training the city's industrial and trade schools must offer as a preparation for vocational competence has been started under the direction of a committee appointed by Dr. George J. Ryan, president of the board of education, and Dr. W. J. O'Shea, superintendent of schools. The committee will study new occupational opportunities afforded the vocational-school graduates by recent industrial developments and will determine what are the demands of industry with a view of devising ways and means of meeting them. The findings of the committee will be used as a basis for working out a more up-to-date school program.

The survey is intended to bring about a reorganization and unification of all vocational activities of the school board.

New Brooklyn Technical High School to Serve Over 5,000 Students

The new technical high school, to be erected in Brooklyn, New York, will be of Collegiate Gothic architecture and will serve 5,500 boys. The building will have 230 rooms or units, a cafeteria, a library, and an auditorium with a capacity of 3,000 persons. It will be equipped with an interschool dial telephone system and an interschool broadcasting system. Nine elevators will be used to provide access to the different parts of the building.

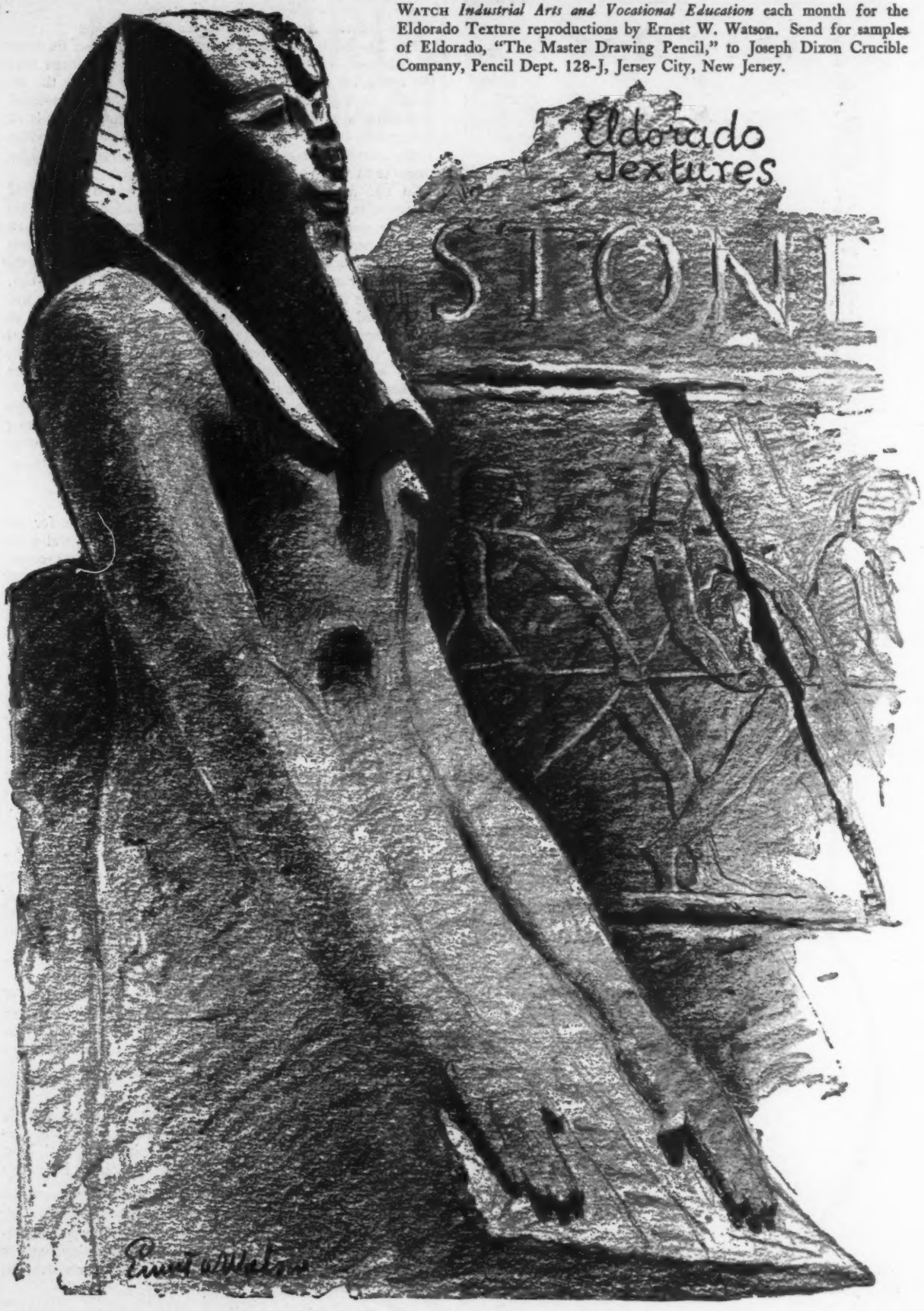
A Program of Cooperative Training

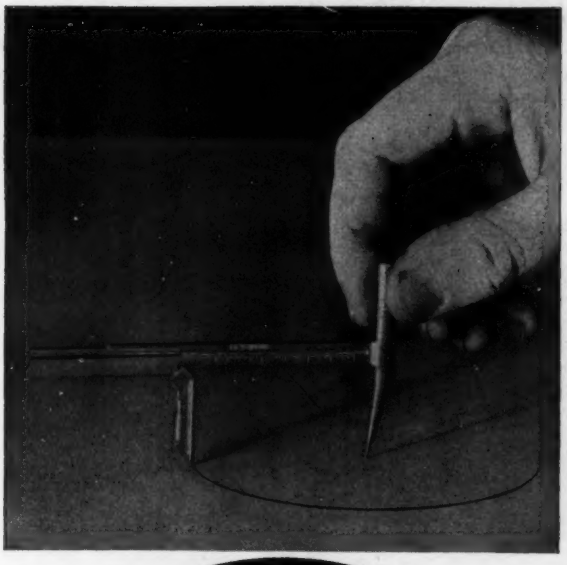
The school board of San Antonio, Tex., has discontinued its full-time vocational-training program and has substituted in its place, a part-time school program to be supplemented by actual work in the trades.

Under the new arrangement, the student who has completed junior-high-school work may enroll in a senior school as a student of a certain trade. Part of the time will be spent in school, while the balance will be given to employment in the chosen trade. The new program will cost approximately $55,000 per annum, of which the school district will pay $20,000, and the balance will be borne by state and federal boards.

(Continued on Page 42a)

WATCH *Industrial Arts and Vocational Education* each month for the Eldorado Texture reproductions by Ernest W. Watson. Send for samples of Eldorado, "The Master Drawing Pencil," to Joseph Dixon Crucible Company, Pencil Dept. 128-J, Jersey City, New Jersey.





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(Continued from Page 40a)

Mellon Institute Announces Plans for New Building

Dr. Edward R. Weidlein, director of the Mellon Institute of Industrial Research, Pittsburgh, Pa., has announced that the institution has increased its facilities for serving the industries by a building project which has enabled the material expansion of its research activities. The building, which is to occupy the site of the institute's Building No. 2, provides ample space for housing many more industrial fellowships than the 63 which at present tax the institutions facilities.

In addition to providing a greatly increased number of laboratories, the building offers more commodious quarters for the general departments. The department of research in pure chemistry is to be expanded and facilities for research in other branches of science will be added. Elaborate chemical-engineering laboratories are to be available in the building. Fellowships in each separate field of industrial research will be grouped in suites of rooms so that they can make use of general apparatus adapted to their needs. A number of special rooms will be equipped for phases of experimental technique, such as electrochemistry, spectroscopy, low-temperature studies, radiations, and high-pressure experimentation.

The building is so designed that additional laboratory suites may be constructed in the interior courts, without marring the beauty of the building, or interfering with the original units.

Statistical Report of the Manual-Education Division of Los Angeles Schools

Mr. C. A. Kunou, supervisor of manual education for the public schools of Los Angeles, Calif., has issued a statistical report for the second semester ending with June, 1930, covering the buildings, pupils, teachers, and activities of the department. The report shows a total of 24,397 pupils engaged in this work, divided between 23,196 pupils in regular rooms, 358 in special rooms, and 816 in development rooms. A total of 2,131 classes were conducted in regular and special rooms, of which 1,809 were held in regular rooms. These classes were in charge of 114 teachers, with 99 in regular rooms, 11 in development rooms, and the remainder in special rooms and offices. The average number of pupils per teacher in regular rooms was 234, in special rooms 105, and in development rooms 74, making a total of 213 pupils per teacher. The average number of classes per teacher was 19, the average number of pupils per class 11, and the total average number of pupils including repeats was 14.

Beloit Vocational Budget is $57,955

The vocational-school board of Beloit, Wis., has adopted a budget of $57,955, as compared with $58,178 expended during the past year. Of the total, $40,164 will be raised by taxation, as compared with $40,455 for last year. Salaries of teachers heads the list of items in the budget, with new tools among other large items.

More Vocational Teachers

Mr. George Loewy, district superintendent in charge of vocational training in New York City, has recommended an extension of vocational training in the city schools. He asks for 19 more shop teachers and the organization of 26 new shop classes.

Indiana to Study Part-Time System

State Supt. R. P. Wisehart, of Indiana, has begun a study of the part-time vocational-school system, as it is being operated in Milwaukee, under the Wisconsin Vocational Law. It is the purpose of the state department to obtain legislative action along the Wisconsin idea.

Funds Voted for New Technical High School

The city board of estimate of New York City has appropriated $3,750,000 to cover the cost of the new building for the Brooklyn Technical High School, contracts for which will shortly be awarded.